INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

137th Tactical Airlift Wing
Oklahoma Air National Guard

Will Rogers World Airport

Oklahoma City, Oklahoma

FEBRUARY 1989

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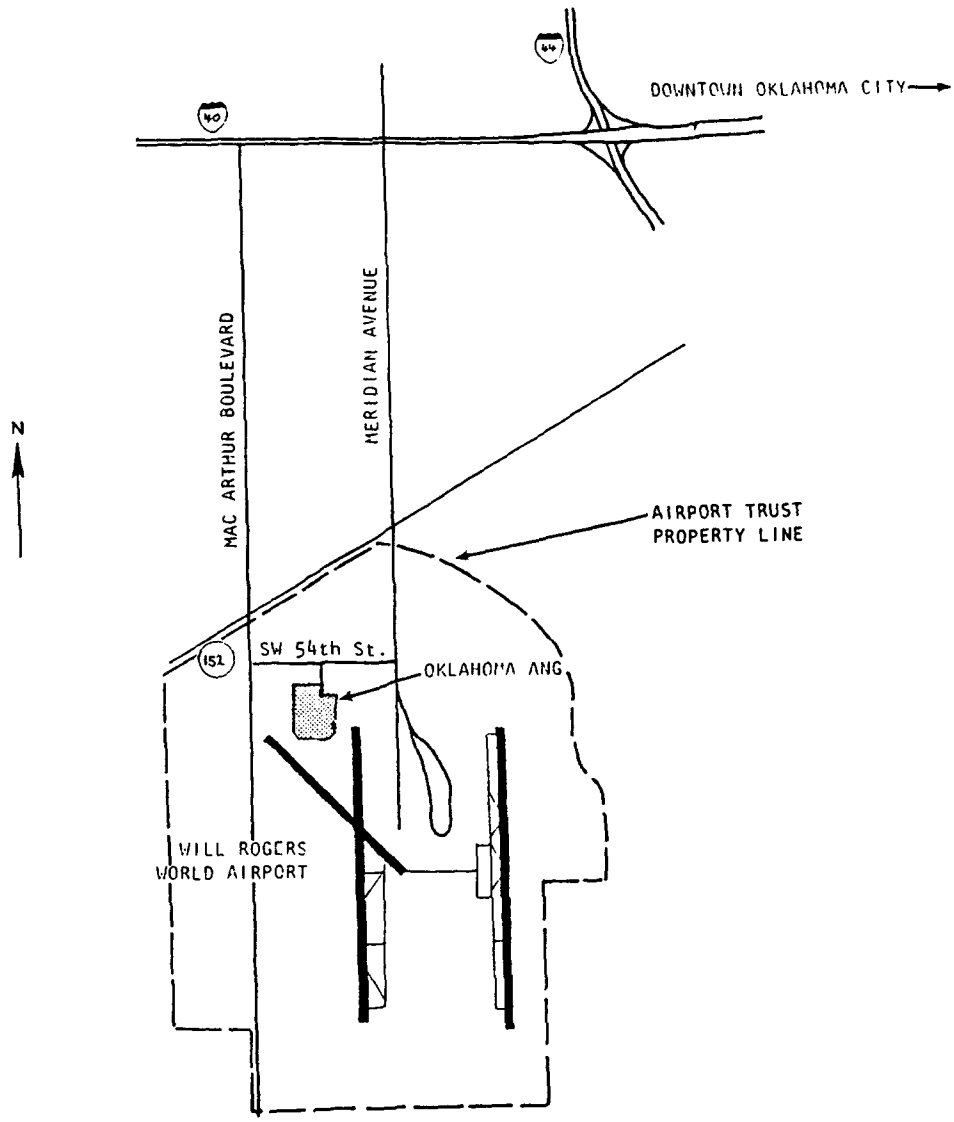

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137TH TACTICAL AIRLIFT WING
OKLAHOMA AIR NATIONAL GUARD
WILL ROGERS WORLD AIRPORT
OKLAHOMA CITY, OKLAHOMA

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Prepared for

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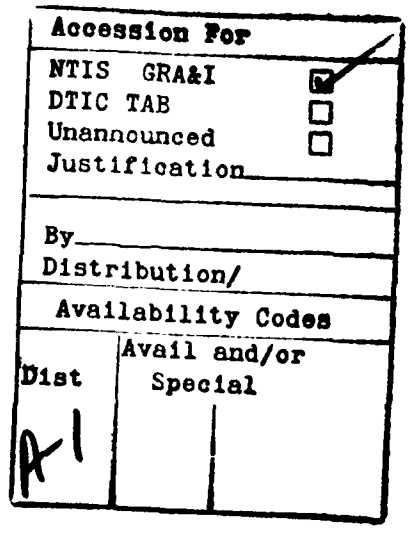

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ACRONYM LIST

ADC	Air Defense Command
AFOEHL	Air Force Occupational and Environmental Health Laboratory
AGE	Aerospace Ground Equipment
ANG	Air National Guard
ANGSC	Air National Guard Support Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980; also called "Superfund"
DD	Decision Document
DoD	U. S. Department of Defense
DoE	Department of Energy
DRMO	Defense Reutilization and Marketing Office
EIS	Engineering Installation Squadron
EPA	U. S. Environmental Protection Agency
FS	Feasibility Study
FTA	Fire Training Area
GEEIA/EI	Ground Electronic Installation Agency/Electronic Installation
HARM	U. S. Air Force Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HRS	Hazard Ranking System
IRP	Installation Restoration Program
NGB	National Guard Bureau
OK ANG	Oklahoma Air National Guard
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
POL	Petroleum, Oil and Lubricant
RCRA	Resource Conservation and Recovery Act
RMS	Resources Management Squadron
SAC	Strategic Air Command
SARA	Superfund Amendments and Reauthorization Act of 1986
SCS	Soil Conservation Service
SI	Site Investigation
TAC	Tactical Air Command
TAW	Tactical Airlift Wing
USAF	United States Air Force
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank
UTA	Unit Training Assembly

EXECUTIVE SUMMARY

A. Introduction

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program Preliminary Assessment (PA) of the 137th Tactical Airlift Wing, Oklahoma Air National Guard (ANG), located at Will Rogers World Airport, Oklahoma City, Oklahoma [hereinafter referred to as the Base].

The PA included the following activities:

- an on-site visit, including interviews with 24 Base personnel (former and active) and field surveys by SciTek representatives during September 26-30, 1988;
- acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Base;
- acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from federal, state, and local agencies; and
- the identification and assessment of sites on the Base that may have been contaminated with hazardous material/hazardous waste.

B. Major Findings

The ANG has utilized hazardous material and generated small amounts of wastes in mission-oriented operations and maintenance at the Base since 1951.

Operations that have involved the use and disposal of hazardous materials include aircraft maintenance, aerospace ground equipment maintenance, vehicle maintenance, and petroleum-oil-lubricant (POL) management and distribution. The hazardous materials disposed of through these operations include varying quantities of waste POL products, paints, thinners, strippers, and solvents.

Field surveys and interviews with 24 Base personnel resulted in the identification of no sites that exhibit the potential for contaminant presence and migration.

C. Conclusions

It has been concluded that there are no sites where a potential for contaminant presence exists.

D. Recommendations

Because no sites were identified, it is recommended that no further work under the Installation Restoration Program be performed.

I. INTRODUCTION

A. Background

The 137th Tactical Airlift Wing (TAW) is located at the Will Rogers World Airport, Oklahoma City, Oklahoma. The 137th TAW has been active at Will Rogers World Airport since 1951, and over the years, a variety of military aircraft have been located and serviced at the Base. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP). The IRP is a comprehensive program designed to:

- Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations, and

- Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5, on December 11, 1981, which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the EPA Superfund programs were essentially the same, differences in the definition of program phases and lines of authority resulted in some confusion between DoD and state/ federal regulatory agencies. These difficulties were

rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes affected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan (NCP) [40CFR300], listing on the National Priorities List (NPL), and removal/ remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding chapter 160, sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

- As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

Preliminary Assessment

A records search designed to identify and evaluate past disposal and/or spill sites which might pose a potential and/or actual hazard to public health, welfare, or the environment.

Site Investigation/Remedial Investigation/ Feasibility Study

The Site Investigation consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the Preliminary Assessment (PA). The Remedial Investigation consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests are required which may necessitate the installation of monitoring wells or the collection and analysis of water, soil and/or sediment samples. Careful documentation and quality control procedures, in accordance with CERCLA/SARA guidelines, ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

- **No Further Action** - Investigations do not indicate harmful levels of contamination and do not pose a significant threat to human health or the environment. The site does not warrant further IRP action and a Decision Document (DD) will be prepared to close out the site.

- **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

- **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include

individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action by the ANG with concurrence by state and/or federal regulatory agencies.

Remedial Design/Remedial Action - The Remedial Design (RD) involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action (RA) is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

Research and Development - Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

Intermediate Action Alternatives - At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils and/or providing an alternate water supply may suffice as effective control measures. Sites

requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA Records Search is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on the Base property.

The potential for migration of hazardous contaminants was evaluated by visiting the Base, reviewing existing environmental data, analyzing Base records concerning the use and generation of hazardous materials, and conducting interviews with present and past Base personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Base; the local geological, hydrogeological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Base and evaluation of potential receptors. The PA included:

- an on-site visit during September 26-30, 1988;
- acquisition of records and information on hazardous materials use and waste handling practices;
- acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat, and related data from federal and Oklahoma state agencies;
- a review and analysis of all information obtained; and

- preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Tracy C. Brown, Research Associate (Environmental R&D); Mr. Jack D. Wheat, Hydrogeologist; and Mr. Ray S. Clark, Civil/ Environmental Engineer. Resumes of Search Team members are included in Appendix A. Mr. Don Williams of the Air National Guard Support Center (ANGSC) is project officer for this Base and participated in the overall assessment during the week of the site visit.

The points of contact at the Base were Major Peter M. Shanahan, Base Civil Engineer; and Major Alan J. Gagnon, Environmental Coordinator.

D. Methodology

Figure I.1 depicts a flow chart of the records search methodology.

The PA began with a site visit to the Base to identify all operations that may have utilized hazardous materials or may have generated hazardous waste. Past and present materials handling procedures were evaluated by extensive interviews with 24 past and present Base employees familiar with the various operating procedures. These interviews were also conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment.

Twenty-four personnel with experience in all areas of Base operations were interviewed during the PA site visit. Knowledge and experience with Base operations averaged 23.7 years and ranged from 3 to 35 years. Records contained in the Base files were collected and reviewed to supplement the information obtained from interviews.

Detailed geological, hydrogeological, meteorological, and environmental data for the area of study were obtained from the appropriate federal and state agencies. A listing of federal and state agency contacts is included as Appendix B.

Preliminary Assessment Methodology Flow Chart

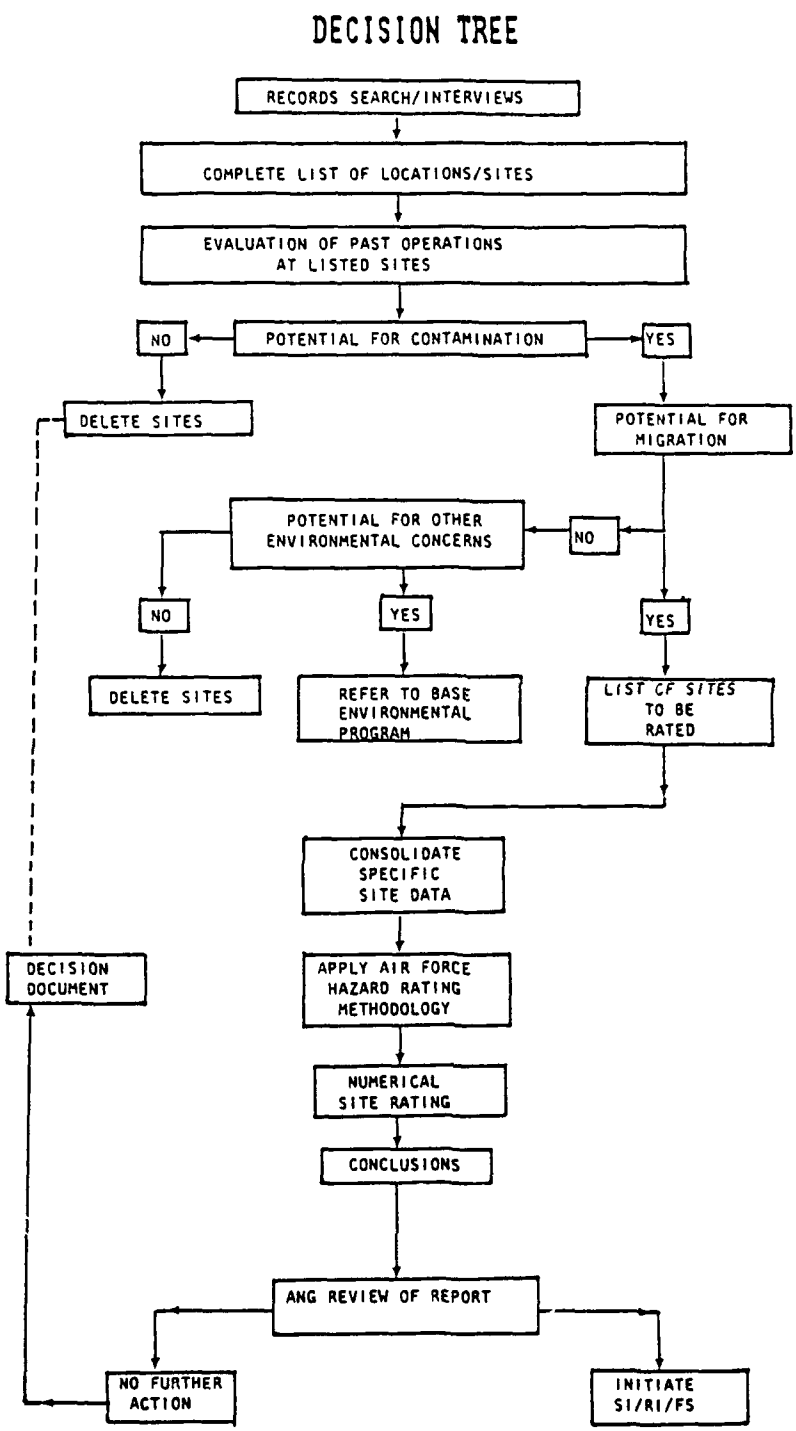

Figure I.1.

After a detailed analysis of all the information obtained, it was decided that no sites are potentially contaminated with hazardous material/ hazardous waste. Under the IRP program, when sufficient information is available, sites are numerically scored using the Air Force Hazardous Assessment Rating Methodology (HARM). A description of HARM is presented in Appendix C.

II. INSTALLATION DESCRIPTION

A. Location

The Base is located approximately 6 miles southwest of Oklahoma City (Section 22, Township 11 North 4 West) and adjacent to Will Rogers World Airport in Oklahoma County, Oklahoma. Major access routes include I-40, I-44, and I-240.

The Base occupies approximately 71 acres on the northwestern part of Will Rogers World Airport. It has a work force of approximately 290 persons over a 24-hour period during regular weekly shifts. On Unit Training Assembly (UTA) weekends, the population of the Base reaches nearly 1270 persons per day.

The Base is headquarters of the 137th Tactical Airlift Wing (TAW), the 205th Engineering Installation Squadron (EIS), and their support units.

Figure II.1 illustrates the location and boundaries of the Base.

B. History

The 185th Fighter Squadron of the Oklahoma ANG was established in 1947. The move to Will Rogers Airport from Max Westheimer Field in Norman, Oklahoma, was completed early in 1951 and brought with it the P-51 Mustang. Later in 1951, the 185th Fighter Squadron was reorganized as the 185th Tactical Reconnaissance Squadron and was gradually equipped with the North American RF-51D. During January 1952, the 185th transferred to Shaw Air Force Base only to return on December 31, 1952, reorganized as the 185th Fighter-Bomber Squadron. The unit had one each P-51H, C-47, and T-6 with which to train. Within 6 months, four P-51Ds were assigned to the unit, and the P-51H was transferred out.

SciTek

Location Map Oklahoma Air National Guard 137th Tactical Airlift Wing

Source: Drawn by Jack Wheat

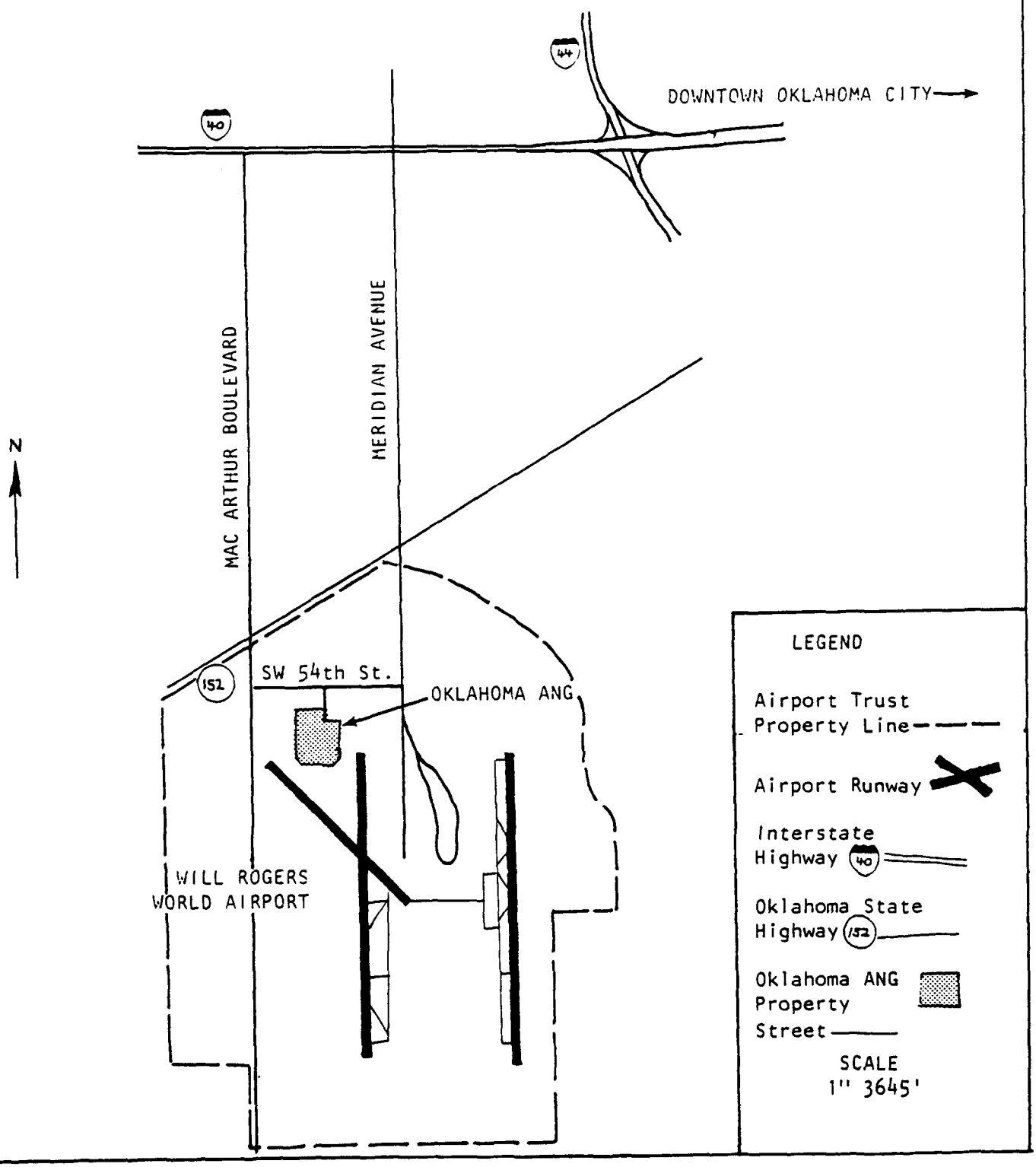

Figure II.1.

In July 1953, the Mustangs were finally phased out (for the last time) in favor of the F-80B Shooting Star, and the command was redesignated as the 185th Fighter Squadron. The F-80Bs were modified into F-80Cs a year later by the installation of a more powerful engine. Later, the F-80Cs were equipped with J33-A-35 engines and continued in service for five more years.

In 1957, the OK ANG was given a major role change in becoming a Fighter-Interceptor Unit assigned to Air Defense Command (ADC). The 185th was issued the North American F-86D on May 1, 1958. The F-86 continued to be the 185ths workhorse until 1960. During April 1960, the 185th received the newer F-86L and for a short time thereafter remained a fighter-interceptor unit.

On April 1, 1961, the Base was relieved of the Air Defense Mission, was assigned an Air Transport mission, and became the home of the 185th Air Transport Squadron, an element of Air Transport Command. The Boeing-built KC-97F "Stratocruiser" was introduced and operated from April 1961, until February 1963. From February until October 1963, they flew the KC-97G. Although both aircraft carried the air refueling designation, they were operated strictly in the cargo mode. During October 1961, the Base received the C-97G, which was utilized until March 31, 1968. On January 1, 1968, the designation was changed from Air Transport Squadron to Military Airlift Squadron as Air Transport Command became Military Airlift Command. On February 28, 1968, while still equipped with the C-97Gs, the Base received its first Douglas C-124C "Globemaster" and later received seven more.

In April 1968, the Aerial Port Flight was formed and added to the Group. Also, the 137th Aeromedical Evacuation Flight (later Squadron) was added to the unit. And, on May 1, 1970, two GEEIA (Ground Electronic Installation Agency)/EI (Electronic Installation) squadrons were assigned to the Base. These squadrons were the 205th and the 219th. The Aeromed unit operated at the Base until August 17, 1973, but was reconstituted in December 1988.

By the early 1970s, the regular Air Force had completely phased out the C-124s. When the 137ths nondestructive inspection technicians discovered major, fleet-wide main wing spar cracks, the aircraft were all immediately grounded. Then, they were all cleared for a final flight to the aircraft "boneyard" in Arizona. On December 10, 1974, because of the premature retirement of the C-124, the Base received the Lockheed C-130A "Hercules," a four engine, turbo-prop transport.

Short-range, low-level tactical aircraft became the order of the day. Accordingly, the unit's designation was changed to the 137th TAW and the 185th Tactical Airlift Squadron. The new designation was accompanied by an aircraft change. On June 23, 1979, the first four of a total of eight C-130Hs landed at Will Rogers World Airport.

Changes in mission and/or aircraft are often accompanied by alterations in Base operations. These alterations usually mean changes in the types and quantities of wastes generated and the methods of waste disposal. For example, in the early 1960s when the Base converted from fighter to transport aircraft, quantities of wastes generated by aircraft maintenance increased. The larger, multi-engined aircraft produced higher volumes of waste oils during routine maintenance than had the single-engine fighters.

Because of their size and the number of engines on each aircraft, the early transports had a much higher fuel consumption than early aircraft. Since larger volumes of fuel were being handled, the risk of fuel spills at the Base increased.

Some of the early transport aircraft (KC-97s and C-124s) had a tendency to leak oil on the aircraft parking apron. The large oil patches that formed on the apron were often washed-down, and the water and floating oil drained directly into the storm sewer system. Leaking oil also collected on the aircraft skin, both incidentally and as a by-product of routine maintenance activities. Because these aircraft were larger than the previously used fighters, much larger quantities of cleaning compounds, usually mixed with solvents to cut the

oil, were used to clean them. In addition, washings were probably more frequent. Prior to 1970, increased volumes of solvent-contaminated wash water drained into the storm sewer system.

The types of solvents used to wash aircraft and clean parts have changed through the years as a result of new technologies, processes, or executive orders. New, improved products that are environmentally safer than their predecessors are the cause for many of the changes. In the past, solvents such as trichloroethylene (TCE), methyl ethyl ketone (MEK), and Type I Stoddard Solvent (PD-680) have been utilized at the Base. Presently, Type II Stoddard Solvent (PD-680) and B&B-2020 is used.

Modifications in processes have also resulted in changes concerning wastes and waste disposal methods. For example, the installation of oil/water separators has induced waste recovery, resulting in wastes being disposed of by contract. Also, the construction of a new facility can alter waste types, amounts, and methods of disposal. Initially, aircraft were washed at an outside washrack (Building 1011) that drained to the storm sewer system. In 1970, the new wash rack at Building 1013 was constructed and the old washrack was abandoned. Liquids entering drains at the new washrack empty into the sanitary sewer after passing through an oil/water separator. This facility recovers most wastes that enter the drains. And, any wastes flowing through the oil/water separator will be recovered and/or treated at the wastewater treatment plant.

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data were obtained from the weather station at Will Rogers World Airport and from Weather of U.S. Cities:

The climate of Oklahoma City falls mainly under continental controls characteristic of the Great Plains Region. The continental effect produces pronounced daily and seasonal temperature changes and considerable variation in seasonal and annual precipitation.

Summers are usually long and hot with temperatures exceeding 100 degrees on an average of 10 days. Winters are comparatively mild and short with temperatures rarely dropping below zero degrees Fahrenheit. The record mean annual temperature (1958 - 1987) is 60.1 degrees.

Precipitation is fairly well-distributed through the year. Summer precipitation usually comes in the form of showers and thunderstorms, while winter precipitation is generally associated with airmass movements and changes. The record rainfall mean (1958 - 1987) is 32.15 inches. The 1-year, 24-hour rainfall is approximately 3.0 inches (47 FR 31235, July 16, 1982). The maximum amount of precipitation on record for a 24-hour period is 8.95 inches, occurring in 1983. Using the mean annual pan evaporation from Lake Overholser, 66.54 inches (1952 - 1979), the net precipitation in Oklahoma City is -34.39 inches according to the method outlined in the Federal Register (47 FR 31224, July 16, 1982).

B. Geology

The Base is located within the Central Red Bed Plains Physiographic Province. This province is located in central Oklahoma, southern Kansas, and northern Texas. Its distribution in relation to the Base and the State of Oklahoma is illustrated in Figure III.1.

urce: Curtis, Ham, 1979.

Areal Distribution Of The Red Bed Plains Physiographic Province In Relation To The Oklahoma ANG

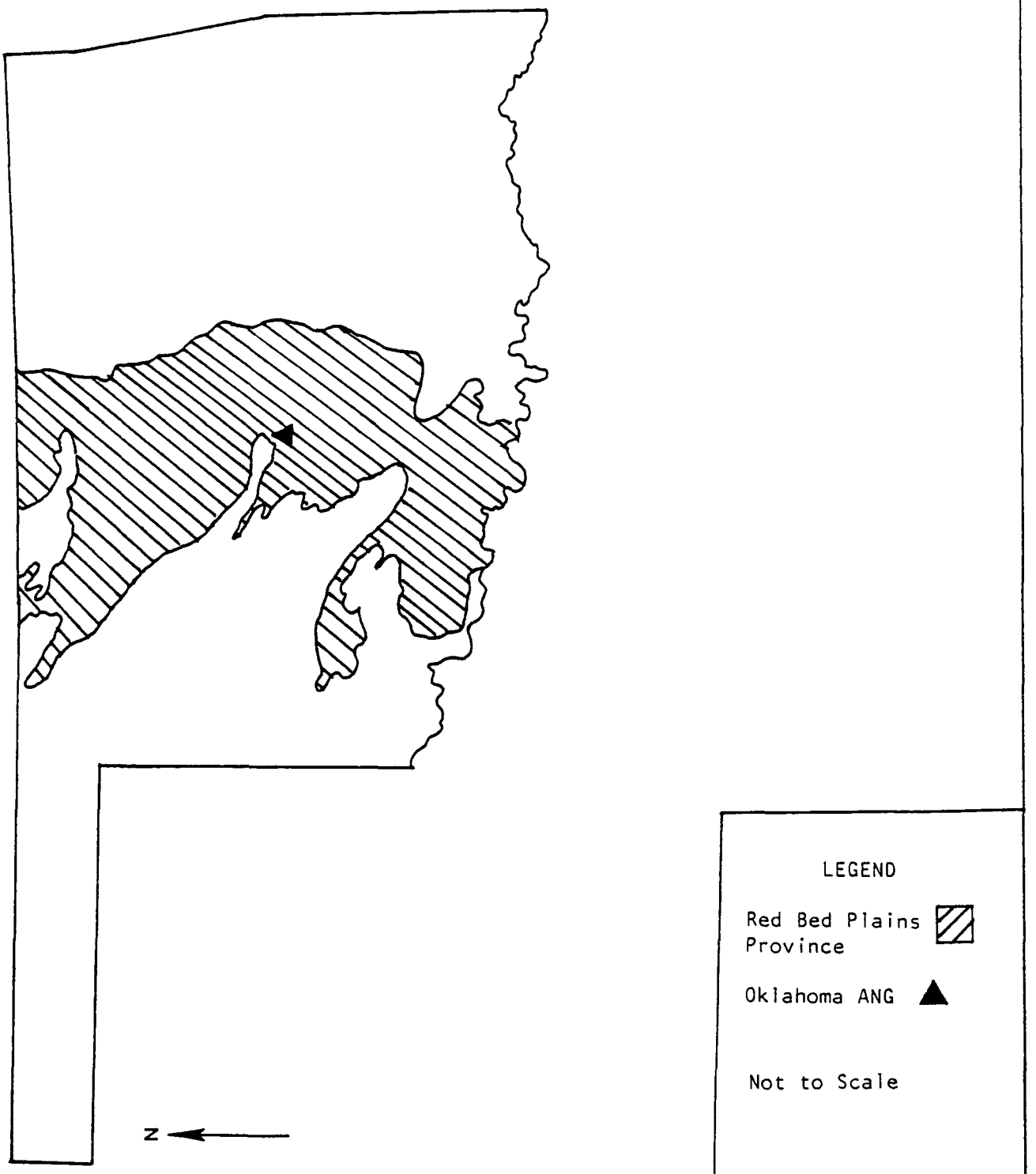

Figure III.1

SciTek

Source: Drawn by Jack Wheat.

Subsurface Stratigraphy At The Base

Age	Formation	Thickness	Lith-ology	Description
Permian	Hennessey	200'-300'		Shale with occasional sandstone intervals
	Garber Wellington	1000'		Interbedded sequence of lenticular sandstone intervals and shale

LEGEND

Sandstone

Shale

Silty Shale

Figure III.3.

lenticular channels occur at various stratigraphic intervals. These channels are lithologically composed of fine-grained, cross-bedded, and loosely cemented quartz sandstones. The thickness of these channels ranges from a few inches to a maximum of 50 feet. Illustrated in Figure III.4 is a geologic cross section compiled from wells drilled at Tinker Air Force Base, illustrating deltaic sandstone channels within the Garber and Wellington Formations. In addition to deltaic channels, interfingering facies changes from sandstone to siltstone to shale is quite common throughout the Garber and Wellington Formations.

Terrace deposits occur along the valleys of surface streams. Deposits of this type in the vicinity of the Base concentrate along the Canadian and North Canadian Rivers. These deposits consist of unconsolidated sediments composed of sand, silt, and clay. Lenticular channels composed of unconsolidated quartz sand occur at various stratigraphic intervals. Sediments of this type were deposited by ancestral surface streams that occupied the same valley as the present surface stream. The maximum thickness of these terrace deposits is 80 feet.

C. Soils

Correspondence with the United States Department of Agriculture (USDA), Soil Conservation Service (SCS), indicates that soils both on and in the immediate vicinity of the Base belong to the Renfroe Soil Series. This series is comprised of clay and clay loam soil types. The subsoil or substratum contains a higher clay composition than the surface soils. Soil thickness ranges from 4 to 8 feet. Soil permeability, which was tested by the SCS to a depth of 54 inches, is less than 0.05 inches/hour (3.53×10^{-5} cm/sec).

Soil scientists at the SCS indicated that no consistent shallow water table occurs within the Renfroe Soil Series. Although perched water tables occur in low-lying areas during periods of heavy precipitation, previous soil investigations have revealed no shallow, perched water table at the Base

Surface topography throughout the Central Red Bed Plains Province consists of rolling hills, flat plain prairies, and wide stream valleys. The occurrence of each of these land forms is affected by the outcropping or surface stratigraphy. Surface elevations range from 870 to 1400 feet Above Mean Sea Level (AMSL). Local topographic relief ranges from 50 to 200 feet. The land surface at the Base is relatively flat with slight evidence of topographic relief.

The subsurface stratigraphy at the Base was deposited on the eastern flank of the Anadarko Geosynclinal Basin and has a westward regional dip of 35 to 40 feet per mile. The areal distribution of the Anadarko Basin in relation to the Base is illustrated in Figure III.2.

The subsurface stratigraphy that underlies the soil overburden at the Base consists of a sequence of Permian age sedimentary rocks. This sequence of sedimentary rocks was deposited in a deltaic complex depositional environment. Lithologic rock types include an alternating sequence of sandstones, shales, and siltstones. Sand channels, lenticular sand bars, and vertical and horizontal lithological facies changes occur at various stratigraphic intervals.

The Permian age stratigraphy throughout the Red Bed Plains Province is a 1500 - 2000 foot sequence of sedimentary rocks. Permian stratigraphy in descending sequence proceeds from the uppermost Chickasha through the Duncan, Hennessey, and Garber to the lowermost Wellington formation. Illustrated in Figure III.3 is the subsurface stratigraphy at the Base. The uppermost Hennessey formation is a 200 to 300 foot sequence of brown shales with interbedded siltstones and sandstones. Sandstone intervals are lenticular deltaic channels that range in thickness from 1 to 15 feet. These sandstone channels primarily concentrate at the base of the Hennessey Formation.

The underlying Garber and Wellington Formations consist of a 900 to 1000 foot sequence of interbedded sandstones, shales, and siltstones. Characteristic of deltaic sedimentary deposits,

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Source: Johnson, 1979.

Areal Distribution Of The Anadarko Basin

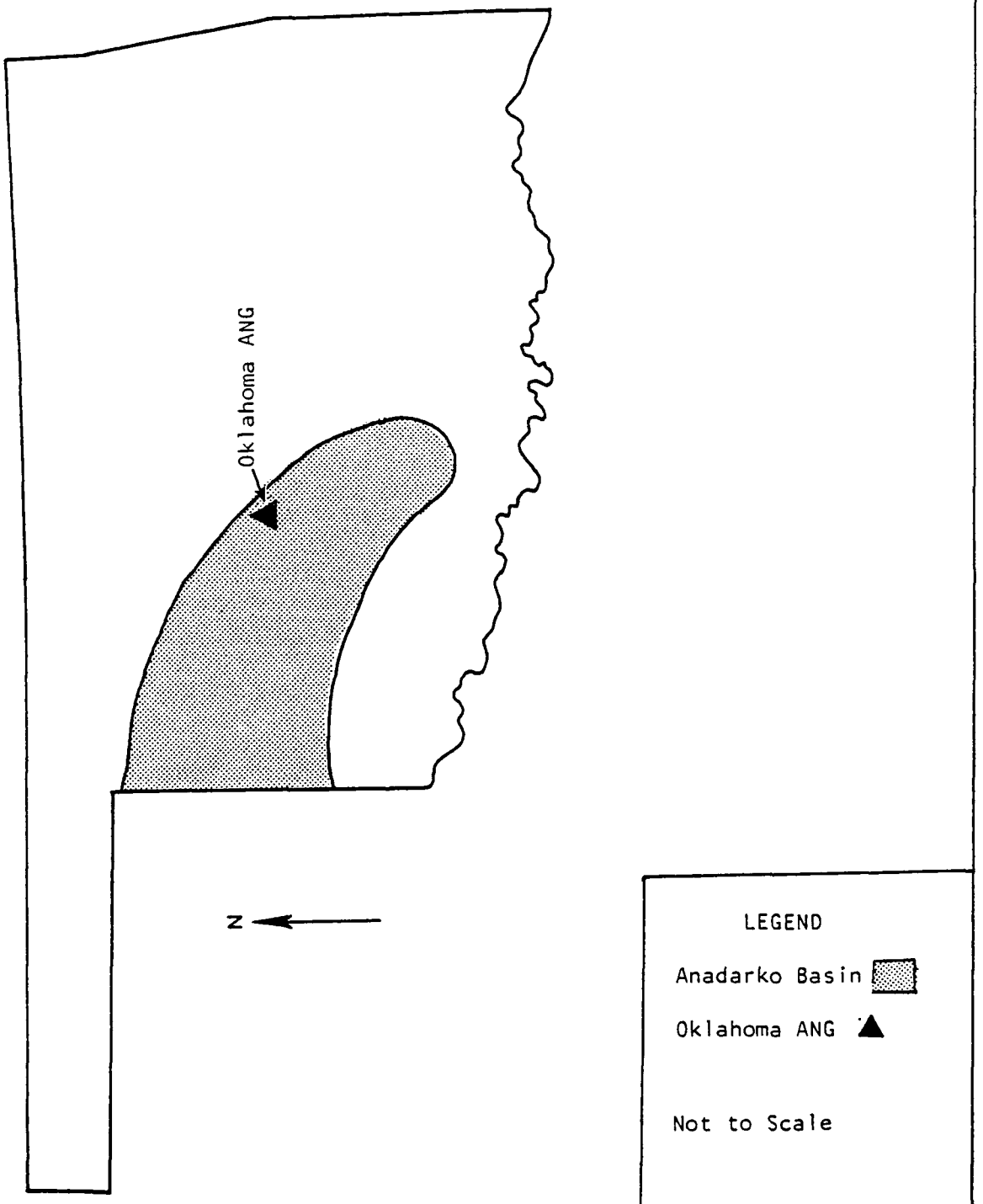

Figure III.2.

SciTek

Source: Wickersham, 1979.

Geologic Cross Section At Tinker Air Force Base Illustrating Sandstone Channels Within The Garber And Wellington Formations

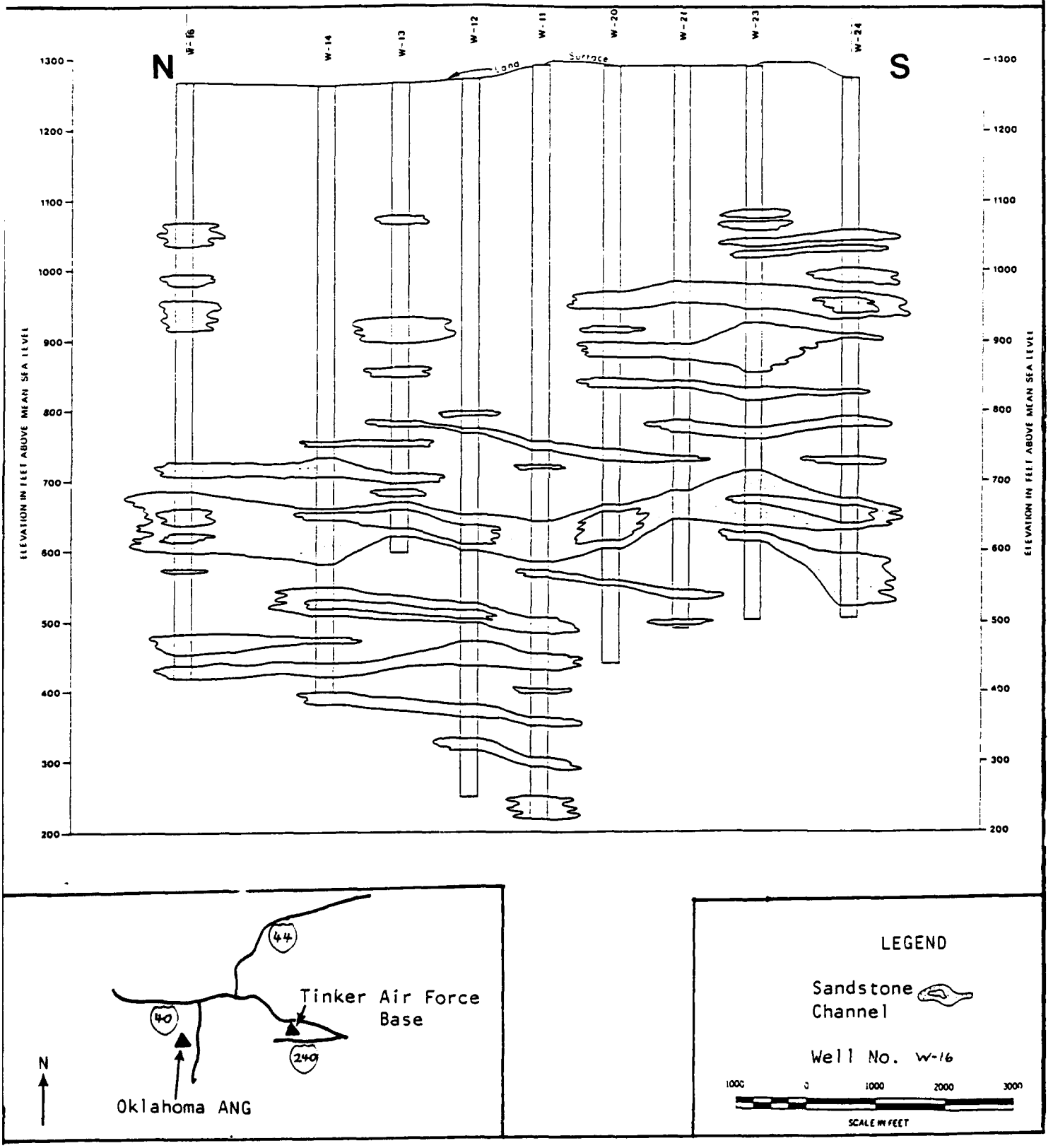

Figure III.4.

or in its immediate vicinity. However, shallow groundwater may accumulate and migrate along the soil-bedrock interface during periods of heavy precipitation. Past construction of Base facilities has penetrated small amounts of shallow groundwater in the weathered zone directly below this soil-bedrock interface.

Soil borings were done to test soil conditions prior to the construction of Base facilities (Appendix D). The maximum soil thickness was 7 feet. A typical vertical soil profile from borings at the Base is from 0 to 2 feet (dark brown silty clay), 2 feet to 5 feet (brown silty clay), and 5 to 7 feet (red silty clay). No shallow groundwater was penetrated by any of the borings.

D. Hydrology

1. Surface Water

Surface water within the Base complex is collected in a series of man-made ditches, storm sewers, and drainage swales (Figure III.5). This surface water is discharged on the north end of the Base at the main storm drain outfall, located near the Base's jet engine test stand. The effluent from this storm drain exit flows into a small, unnamed tributary of the North Canadian River (Figure III.6). The confluence of this unnamed creek and the North Canadian River is located approximately 3 miles north of the Base boundary.

2. Groundwater

The principal groundwater aquifers that underlie the Base occur within the Permian age Hennessey, Garber, and Wellington Formations. Groundwater within the Garber and Wellington Formations is classified as the Garber-Wellington aquifer. Groundwater is produced in the vicinity of the Base from the terrace and alluvium deposits that concentrate along the Canadian and North Canadian Rivers.

SciTek

Surface Drainage Routes For The Base

Source: Oklahoma ANG Civil Engineering

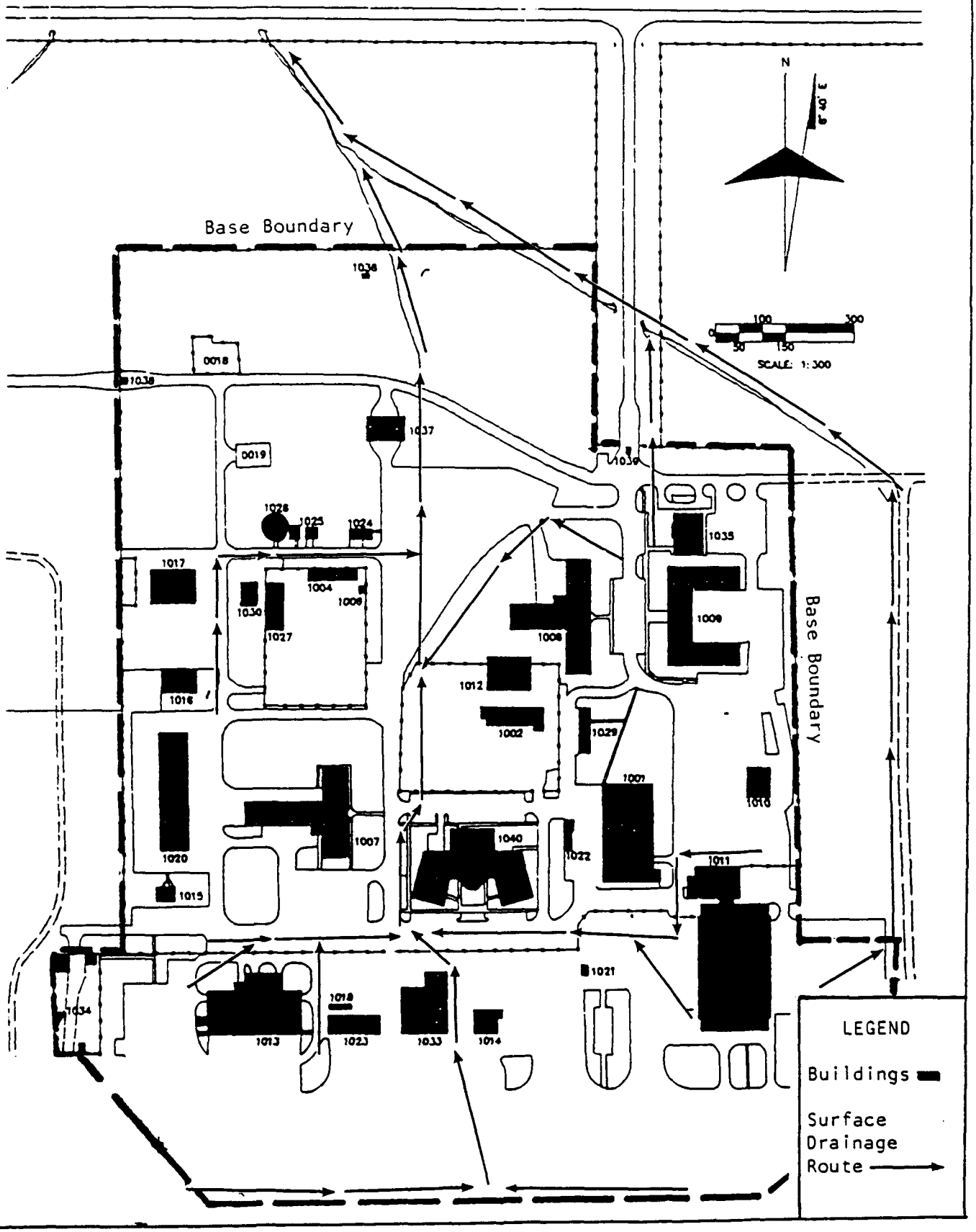

Figure III.5.

SciTek

Source: U.S.G.S. 7.5 Minute Series
Oklahoma City 1956 and Mustang 1966.

Surface Drainage Route For Surface Water Which Exits The Base

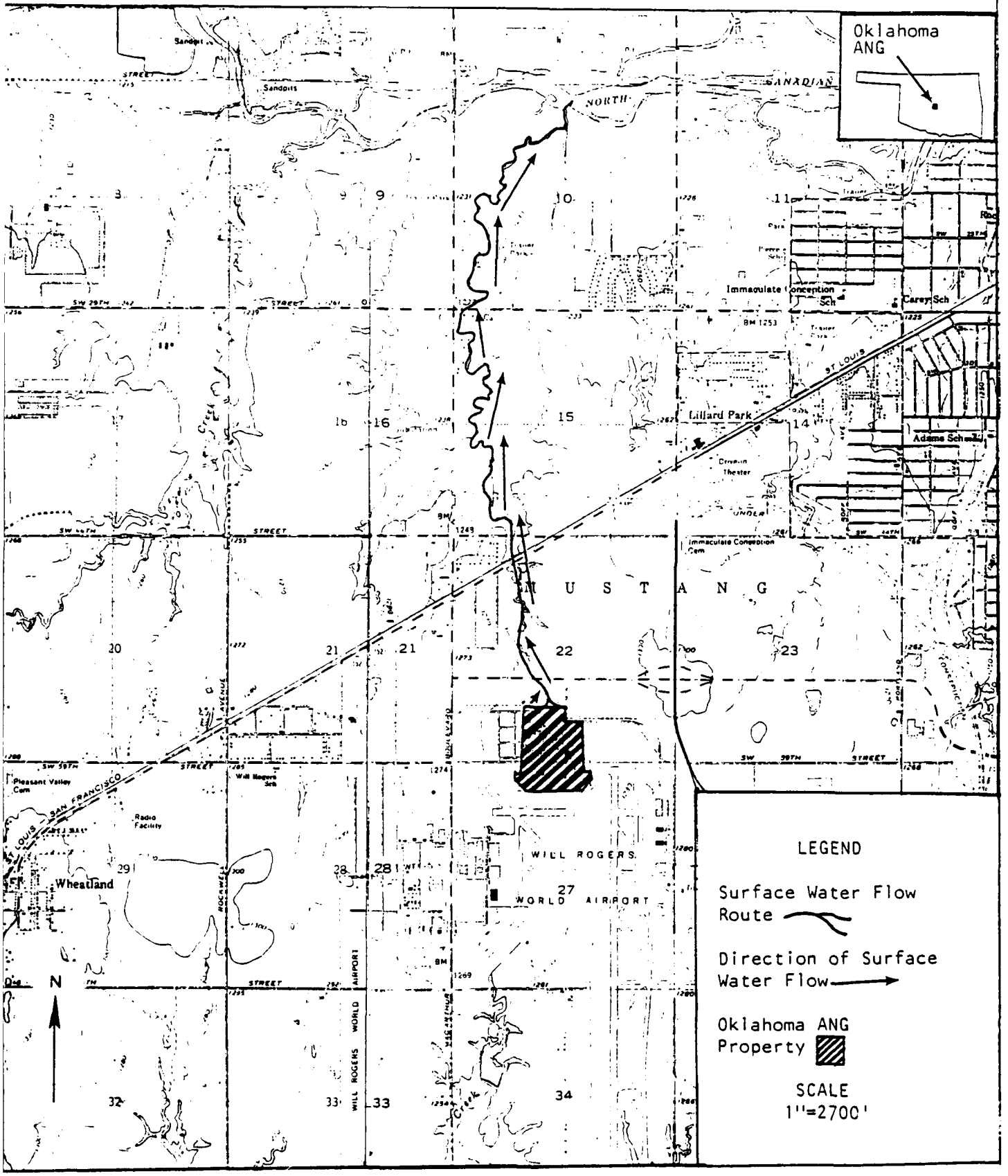

Figure III.6.

The Hennessey aquifer produces groundwater from multiple intervals throughout the Hennessey Formation. The majority of this groundwater concentrates in the weathered zone, which directly underlies the soil overburden. Additional groundwater is produced from multiple fractured intervals throughout the Hennessey Formation. The producing depths for these saturated intervals range from 30 to 300 feet. However, most producing potable wells are drilled to depths less than 80 feet below land surface.

Potable water wells that produce from the Hennessey aquifer have a potential yield of 2 to 60 GPM with an average yield of 15 GPM. The low permeability of the Hennessey shale prevents larger yields. This groundwater yield frequently declines during periods of low precipitation as a result of evaporation from the previously described weathered zone.

Groundwater in the Hennessey aquifer is recharged by percolating surface water derived from precipitation. This percolating surface water migrated downwards and infiltrated the previously described fractured intervals. The low permeability of the Hennessey Formation results in a relatively slow rate of groundwater recharge. Hennessey groundwater migrates in a westward, downgradient direction. This groundwater movement follows the westward down-dip gradient of the subsurface stratigraphy. Hennessey groundwater, which underlies the Base, probably discharges into the local streams.

The Garber-Wellington is the most prominent aquifer underlying the Base and its vicinity. This aquifer is a major groundwater source for Oklahoma City, as well as other cities and towns in central Oklahoma. The Garber-Wellington aquifer encompasses a topographic area of approximately 2000 square miles. The areal distribution of the Garber-Wellington aquifer is illustrated in Figure III.7.

SciTek

Areal Distribution Of The Garber-Wellington Aquifer

Source: Drawn by Jack Wheat.

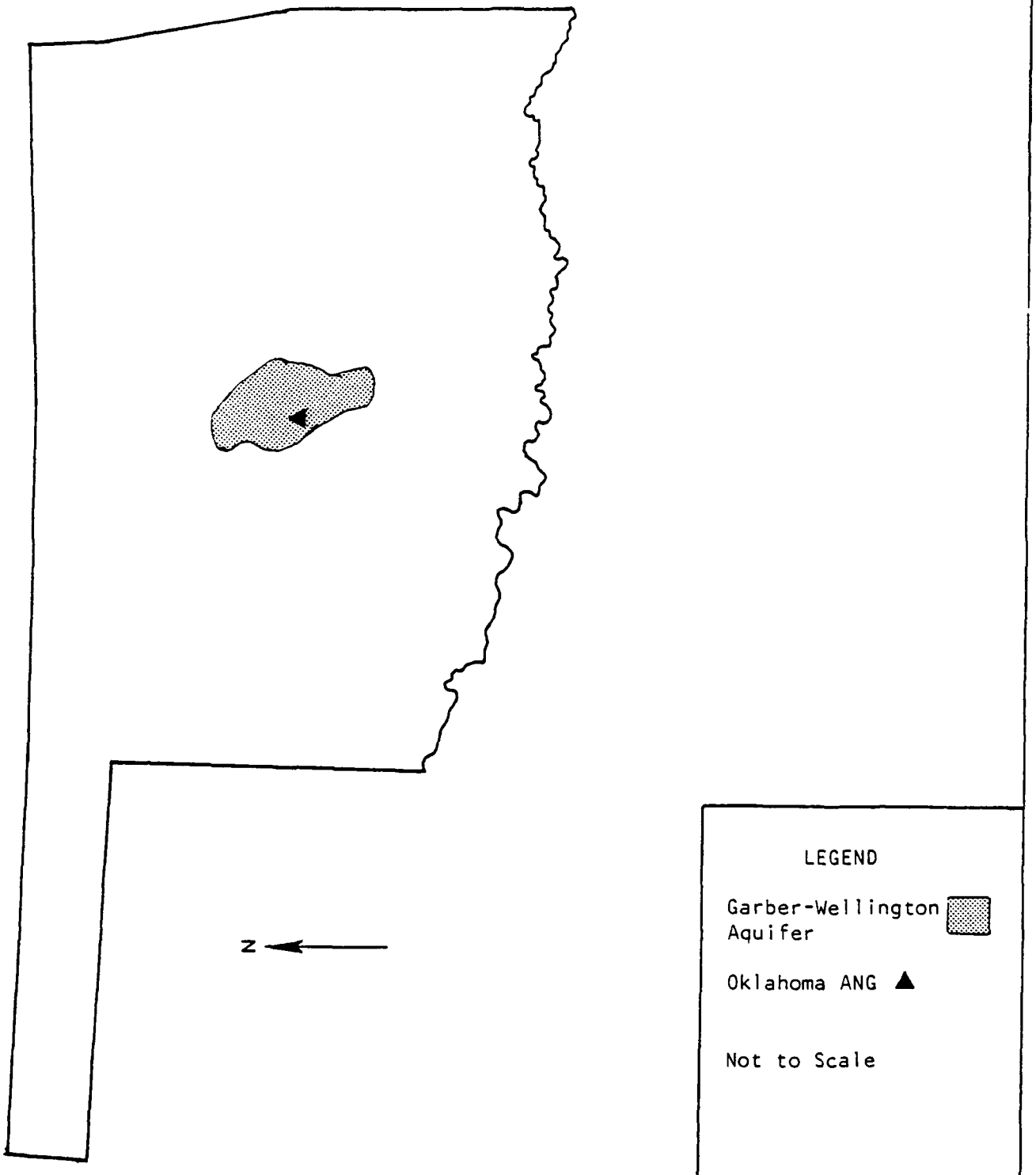

Figure III.7.

Groundwater in the Garber and Wellington Formations is not produced from a single saturated zone. Instead, groundwater is produced from a series of previously described deltaic sand channels. The number of groundwater-saturated sand channels varies from one location to another. Most potable water wells from the Garber-Wellington aquifer produce from as many as 6 to 9 saturated intervals.

Garber-Wellington potable water wells produce from depths of 150 to 1000 feet. Shallow or saturated intervals occur in topographic areas where the Garber and Wellington outcrop. The depth from land surface required to penetrate water bearing zones within the Garber and Wellington Formations increases from east to west. As previously mentioned, this increase in depth is the result of subsurface formations dipping westward into the Anadarko Basin. Potable water well records available at the Oklahoma Water Resources Board indicate that the Garber-Wellington aquifer beneath the Base should be penetrated at depths ranging from 350 to 900 feet below land surface.

The yield from potable water wells that produce from the Garber-Wellington aquifer ranges from 50 to 450 GPM with an average yield of 250 GPM. This large groundwater yield is the result of high permeability within previously described lenticular sandstone channels. The yield of individual Garber-Wellington wells is affected by the number of saturated intervals penetrated, the diameter of the well bore, the size and type of water well pump, etc.

Garber-Wellington groundwater underlying the Base is recharged by percolating surface water in topographic areas where the Garber and Wellington outcrop. This percolating surface water is derived from seasonal precipitation. It has been estimated that 5 percent of the seasonal precipitation that falls over Garber-Wellington outcrop areas is used to recharge the Garber-Wellington aquifer. Like the overlying Hennessey aquifer, groundwater in the

Garber-Wellington aquifer migrates in a westward, downgradient direction. Garber-Wellington groundwater probably discharges into the Canadian and North Canadian Rivers.

Groundwater aquifers occur in terrace and alluvium along the Canadian and North Canadian Rivers in the vicinity of the Base. The areal distribution of these aquifers is illustrated in Figure III.8. Groundwater concentrates in permeable sections of unconsolidated sand and/or gravel. Potable water wells that tap these terrace and alluvium deposits occasionally yield in excess of 100 GPM. However, the average yield ranges from 15 to 30 GPM. Terrace and alluvium deposit aquifers are recharged by the vertical migration of surface water derived from seasonal precipitation.

As illustrated in Figure III.9, numerous potable water wells have been drilled in the vicinity of the Base. These wells were drilled for municipal as well as domestic consumption. They tap both the Hennessey and Garber-Wellington aquifers. The Hennessey aquifer is used for domestic consumption, whereas the deeper Garber-Wellington aquifer is a primary source of municipal water supplies.

Oklahoma City receives its water from potable water wells that tap the Garber-Wellington aquifer and from surface water reservoirs located approximately 8 miles north of the Base. Within a 3 mile radius of the Base, approximately 350 residents are served by water wells. About 600 residents within this radius are served by surface water sources.

The water supply for the Base is municipal water purchased from Oklahoma City. Interviews with numerous personnel revealed that throughout the Base's history no potable water wells have been drilled within the Base's boundaries.

Groundwater samples from the Hennessey and Garber-Wellington aquifers have been analyzed for water quality. Analysis of these samples

SciTek

Areal Distribution Of Terrace And Alluvium Aquifers Along The Canadian North Canadian Rivers

Source: Drawn by Jack Wheat.

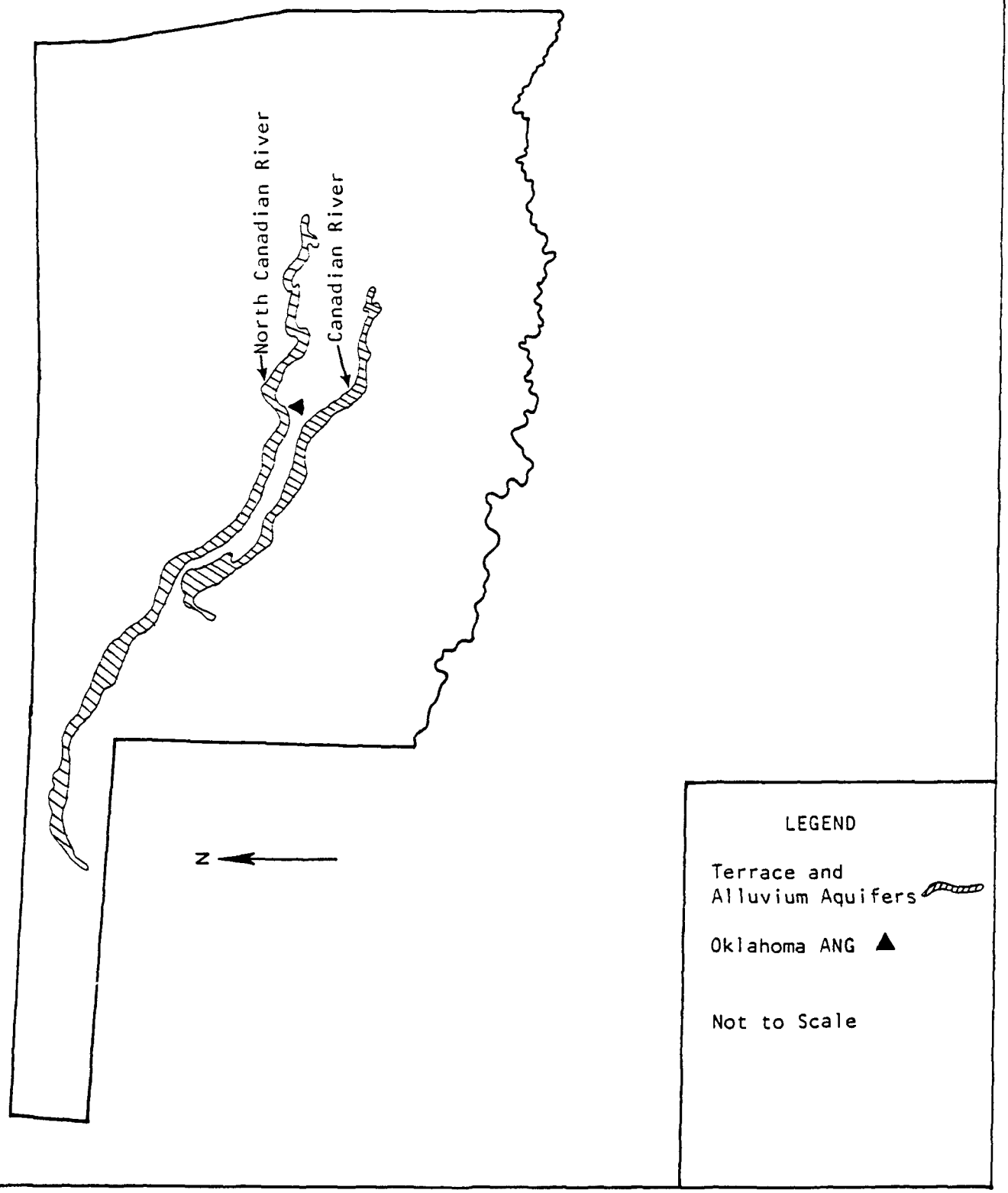

Figure III.8.

CITEK

rce: U.S.G.S. 7.5 Minute Series
ahoma City 1956 and Mustang 1966.

Potable Water Wells In The Vicinity
Of The Oklahoma ANG

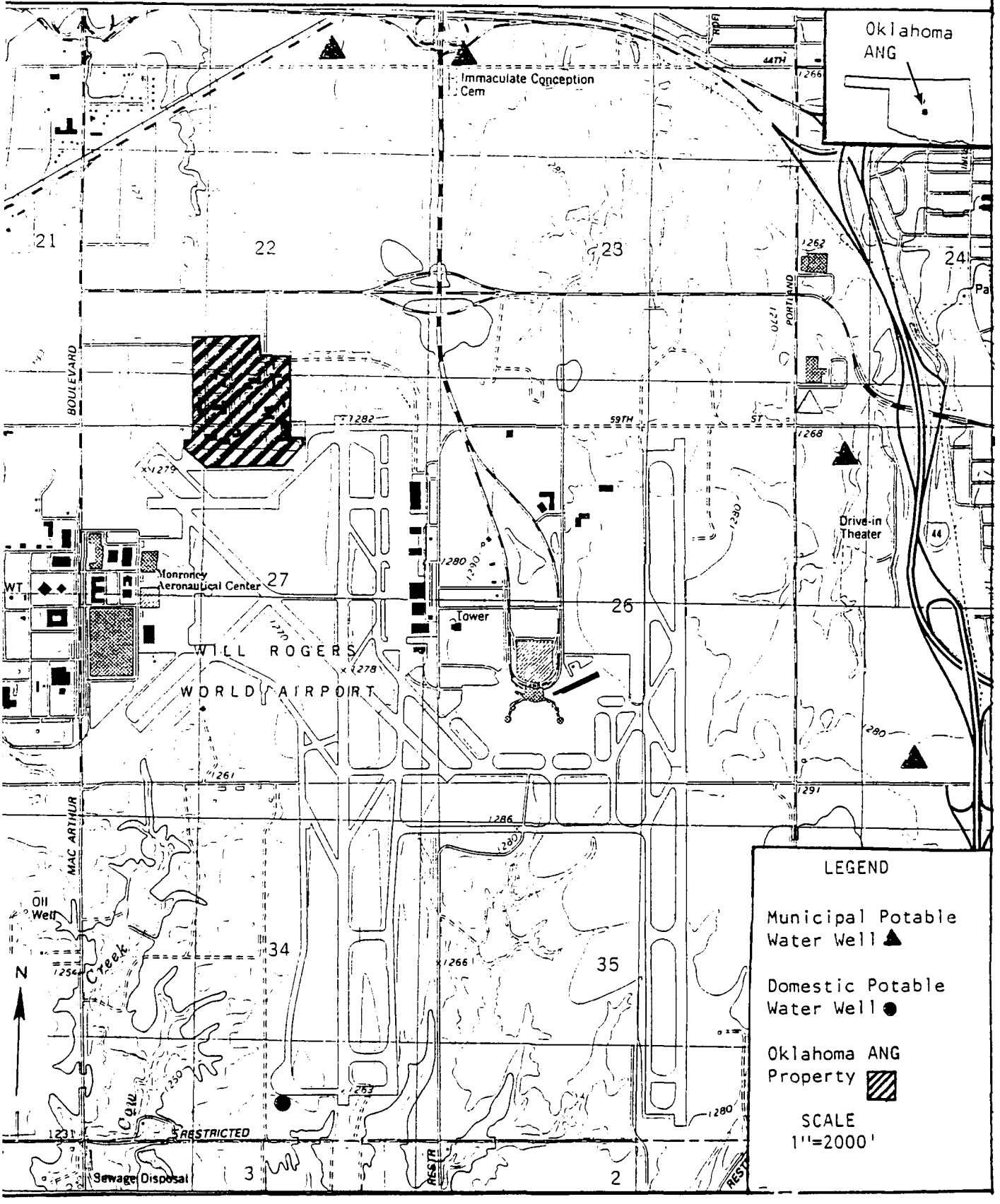

Figure III.9.

revealed a series of chemical constituents that included calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), bicarbonate (HCO_3), carbonate (CO_3), sulphate (SO_4), chloride (Cl), nitrate (NO_3), and dissolved solids. Concentrations of these constituents in samples collected approximately 4 miles west of the Base in Township 11 N-3W are illustrated in Table III.1.

The uppermost Hennessey aquifer is the most susceptible to groundwater contamination from surface pollutants. This groundwater contamination has potential to occur because the Hennessey aquifer is recharged by the vertical migration of percolating surface water derived from seasonal precipitation. Percolating surface water could be a mode of transport for contaminants released upon the land surface. Since the Hennessey aquifer is used for domestic consumption in the vicinity of the Base, potentially contaminated groundwater in the Hennessey aquifer could present a threat to potential receptors. As previously mentioned, the deeper Garber-Wellington aquifer is primarily recharged by percolating surface water in areas where the Garber and Wellington Formations outcrop. Therefore, it is unlikely that groundwater in the Garber-Wellington aquifer would become contaminated if a potentially hazardous substance was released at the Base.

E. Critical Habitats/Endangered or Threatened Species

According to records on file at the Oklahoma Department of Wildlife Conservation, no critical environments, endangered species, or threatened species have been identified within a 1-mile radius of the Base. The nearest protected areas designated as critical habitats under the Endangered Species Act are located several miles from the Base. These areas are the Stinchcomb Wildlife Refuge, Little River State Park, and the Sutton Wilderness Area.

TABLE III.1

Chemical Analyses of Water Samples from Wells in Township 11N-3W, Oklahoma County, Oklahoma (chemical constituents in parts per million)

Well No.	Depth of Well (Feet)	Geologic Source*	Date of Collection	Calcium (Ca)	Magnesium (Mg)	Sodium/ (Na) Potassium (K)	Bicarbonate (HCO3)	Carbonate (CO2)	Sulphate (SO4)	Chloride (Cl)	Nitrate (NO3)	Dissolved Solids**	Hardness CaCO3 Calcium Magnesium	Hardness CaCO3 Noncarbonate	Specific Conductance (Micromhos at 25 C)
3bd	728	Pgw	4-43	30	18	46	268	0	11	12	1.2	250	149	....	446
6cb1	785	Pgw	4-44	28	23	52	299	0	11	0.2	---	278	164	0	494
10da	728	Pgw	4-44	22	24	32	206	6.9	5.0	27	0.05	219	154	0	413
21dc1	200	Ph	6-47	14	37	35	239	8	14	27	1.0	246	187	0	553
21dc2	246	Ph	6-47	13	36	32	195	23	12	27	0.5	257	180	0	516
24ab1	785	Pgw	4-44	37	24	29	268	0	8.0	17	1.0	248	191	0	462
26cb	800	Pgw	4-43	22	22	50	246	14	12	10	2.2	254	146	....	440
33cdc2	273	Pgw	11-48	30	19	153	370	0	125	37	0.0	564	153	0	888
35bd	600	Pgw	4-44	31	24	27	250	5.3	5.0	9.0	2.0	227	176	0	420

* Pgw (Garber Sandstone and Wellington Formation)
Ph (Hennessey Shale)

** Residue on evaporation at 180° C; numbers in parentheses are calculated values.

Source: Wood and Burton 1968: 54

Situated just north of Lake Overholser, the Stinchcomb Wildlife Refuge is approximately 7 miles northwest of the Base. Another lake, Lake Hefner, lies 2 to 3 miles northeast of Lake Overholser. Several sightings of endangered avian species have occurred in this lacustrine wetland area. These species include *Sterna albifrons* (least tern) and *Haliaeetus leucocephalus* (bald eagle). In November 1988, a highly unusual but confirmed sighting of two *Grus americana* (whooping crane) was recorded for this area. However, the infrequency of such sightings would indicate that representatives of these species are transients.

The Lake Overholser/Lake Hefner area is probably not in a position that would allow it to receive water-borne pollutants from the Base. Although the tributary bearing water from the Base's storm sewer outfalls extends northward as it journeys to its confluence with the North Canadian River, this confluence point is located south of Lake Overholser and over 5 miles downstream.

IV. SITE EVALUATION

A. Activity Review

The review of Base records plus interviews with present and former Base personnel identified specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, processed, and disposed. Table IV.1 summarizes the major operations associated with each activity. If an item is not listed in the table on a best-estimated basis, that activity or operation produces negligible (less than 5 gallon/year) waste requiring disposal.

The building numbers and identifications for individual facilities throughout the Base are shown on Table IV.2. Bulk fuel storage for the Base is provided by Will Rogers World Airport. Data on all underground storage tanks on the Base are summarized in Appendix H. Table H.1 contains information concerning fuel storage tanks. Information about oil/water separators and miscellaneous tanks is included in Table H.2. Also, the locations of o/w separators and underground storage tanks at the Base are presented in Figure IV.1.

The potable water supply is provided by the Oklahoma City Water Department. The Oklahoma City Water Department also operates the Wastewater Treatment Plant which treats wastewater from the Base.

By using a small metal container and only a few gallons of fuel, fire extinguisher training has been periodically performed outside of Building 1021. Larger fire training exercises have been traditionally performed off-base. However, there are reports of an abandoned on-base FTA near Building 1009. (See Other Pertinent Facts, Page IV-7).

Table IV.1

Hazardous Material/Hazardous Waste Disposal Summary
Oklahoma Air National Guard

Building	Shop	Possible Hazardous Material/ Waste	Est. Qty. Gal/Yr	Disposal Method 1951	1960	1970	1980	1988
1033	Aircraft Maintenance Engine Shop	Varsol	50	UNK.	STOR.		DRMO.	DRMO
		PD-680	75	UNK.	STOR.		DRMO.	DRMO
		Strippers	4	UNK.		CONT.	DRMO.	DRMO
		Synthetic Turbine Oil	2500	UNK.	CONT.		DRMO.	DRMO
		TCE	20	UNK.		CONT.	DRMO.	DRMO
		Hydraulic Oil	100	UNK.	CONT.		DRMO.	DRMO
1011	Nondestructive Inspection	MEK	55	UNK.	CONT.		DRMO.	DRMO
		Penetrant	300	UNK.		CONT.	DRMO.	DRMO
		Emulsifier	150	UNK.		CONT.	DRMO.	DRMO
		Fixer	40	UNK.		REC.	DRMO.	DRMO
		PD-680	40	UNK.		CONT.	DRMO.	DRMO
	Tire Repair & Reclamation (R&R)	PD-680	36	UNK.			CONT.	DRMO
		Stripping Compound	650	UNK.		CONT.	DRMO.	DRMO
	Sheet Metal	MEK	1	PROC.				PROC
		Alcohol	12	PROC.				PROC
		Cutting Oil	5	PROC.				PROC
	Battery Shop	Used Batteries	25	UNK.			DRMO.	DRMO
		Battery Acid	25	NEU.				NEU
	Corrosion Control	PD-680	55	UNK.	STOR.		DRMO.	DRMO
		Thinners	15	PROC.				PROC
		Strippers	25	UNK.	CONT.		DRMO.	DRMO
		TCE	50	UNK.	CONT.		NLU.	NLU
		Lacquer	10	UNK.	CONT.		DRMO.	DRMO
		MEK	660	UNK.	CONT.		DRMO.	DRMO
		Toluene	15	UNK.		CONT.	DRMO.	DRMO
		Polyurethane Paint	50	UNK.		CONT.	DRMO.	DRMO
		Empty Paint Containers	24 cont.	UNK.	CONT.			CONT
1015	Fuels Management	Off-Spec. JP-4	275	UNK.		REC.		REC
		Off-Spec. AVGAS	250	OFTA.			NLU.	NLU

TABLE IV.1
(cont.)

Hazardous Material/Hazardous Waste Disposal Summary
Oklahoma Air National Guard

Building	Shop	Possible Hazardous Material/ Waste	Est. Qty. Gal/Yr	Disposal Method 1951	1960	1970	1980	1988
1007	Entomology	Engine Oil	6	UNK	CONT		DRMO	DRMO
		Pesticides	0.25	UNK		CONT		CONT
		Empty Pesticide Container	5 bottles	UNK	CONT			CONT
1020	AGE	Engine Oil	500	CONT			DRMO	DRMO
		Hydraulic Oil	40	CONT			DRMO	DRMO
		Paint Strippers/Thinners	100	STOR			DRMO	DRMO
		PD-680	60	STOR			DRMO	DRMO
		Turbine Oil	10	UNK	CONT		DRMO	DRMO
		Gasoline	400	PROC				PROC
		Sulfuric Acid	25	NEU				NEU
		Aircraft Cleaning Compound	330	STOR			O/WS	O/WS
		TCE	50	STOR		NLU		NLU
		Varsol	50	STOR			NLU	NLU
1002	Vehicle Maintenance (Motor Pool)	Engine Oil	500	UNK	CONT		DRMO	DRMO
		PD-680	150	CONT			DRMO	DRMO
1027		Sulfuric Acid	100	NEU				NEU
		Ethylene Glycol	110	STOR			O/WS	O/WS
		Lubricating Oil	10	UNK	CONT		DRMO	DRMO
		Hydraulic Oil	20	UNK	CONT		DRMO	DRMO
		Transmission Fluid	30	UNK	CONT		DRMO	DRMO
		Paint Thinner	30	UNK	CONT		DRMO	DRMO
		Brake Fluid	5	UNK	CONT		DRMO	DRMO
		Bearing Grease	45 lb	UNK	CONT		DRMO	DRMO
1013	Nose Dock	PD-680	700	BNP		DRMO		DRMO
		B&B-2020	825	BNP		DRMO		DRMO
		MEK	220	BNP		DRMO		DRMO
		Polyurethane Paint	100	BNP		DRMO		DRMO
		Poly Thinner	25	BNP		DRMO		DRMO
		Lacquer Paint	10	BNP		DRMO		DRMO
		Lacquer Thinner	10	BNP		DRMO		DRMO
		CBA6 Soil Barrier	275	BNP		O/WS		O/WS

TABLE IV.1
(cont.)

ACRONYMS: BNP - Building not present.
CONT - Disposed of through contractor.
DRMO - Disposed of through DRMO.
NEU - Neutralized and disposed of through sanitary sewer.
NLU - No longer used.
O/WS - Disposed of in drains leading to an oil/water separator and to a sanitary sewer.
OFTA - Off-site fire training area (joint use).
PROC - Disposed of by process (i.e. evaporation).
REC - Material is recycled.
SAN - Disposed of in drains leading to sanitary sewer.
STOR - Disposed of in drains leading to storm sewer system.
UNK - Disposal method unknown.

TABLE IV.2

Building Number and Identification

Building No.	Facility Name
1001	Base Supply
1002	Base Motor Pool
1004	CE Storage
1006	Paint Storage
1007	Civil Engineering
1008	205th EI Squadron
1009	Wing Hq./Base Admin./CBPO
1010	Storage
1011	Acft. Maintenance Hangar
1012	Vehicle Storage
1013	Nose Dock. Maint. L/A
1014	Fire & Crash Station
1015	Base Fuels
1016	NCO Open Mess
1017	Aerial Port Training
1018	Air Cargo Terminal
1020	AGE Shop
1021	Fire Ext. Training
1022	Hazardous Storage
1023	Aerial Port Tng. Facility
1024	205th EIS Storage
1025	Disaster Preparedness Stor.
1026	Radar Tower Bldg.
1027	205th EIS Motor Pool
1029	Security Police/Law Enforcement
1030	Airlift Control Element
1033	Engine NDI Lab, I/R shop
1034	LOX Facility
1035	Tactical Hospital
1036	Gas Mask Tng. Facility
1037	Mobility Storage Warehouse
1038	West Gate House (Gate 2)
1039	Main Gate House (Gate 1)
1040	Sq. Operations/Telecom

SciTek

Source: Oklahoma ANG Civil Engineering.

Oil/Water Separators Underground Storage Tanks USTs At The Oklahoma ANG

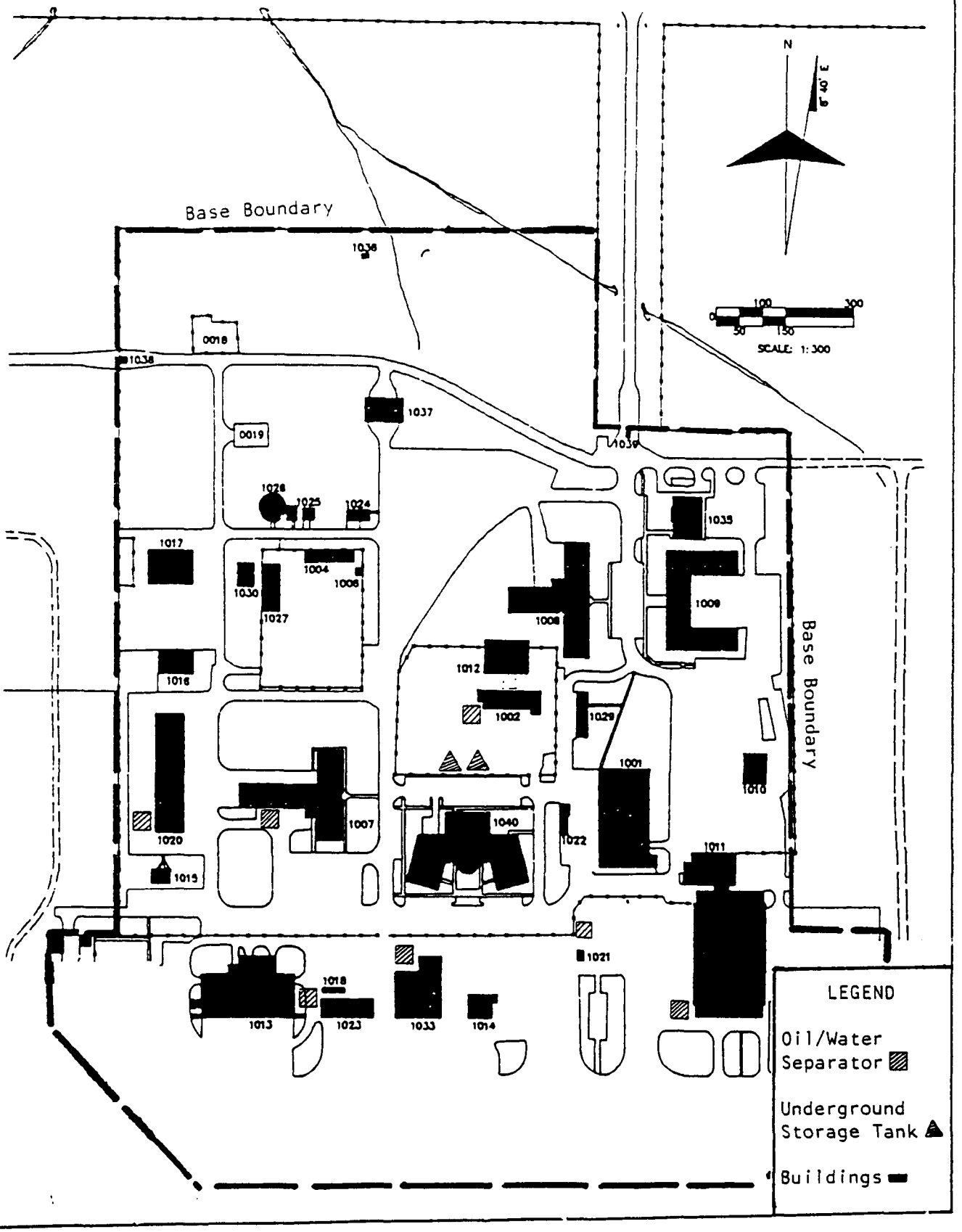

Figure IV. 1.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Interviews with 24 Base personnel and subsequent site visits were used to identify sites that are potentially contaminated as a result of past Base operations. As a result of this assessment, no potentially contaminated sites were identified.

Surface water is a mode of transport for released contaminants through the Base storm drain system and the North Canadian River Watershed. The potential for the uppermost Hennessey aquifer to become contaminated by released surface pollutants is mitigated by low soil permeability.

C. Other Pertinent Facts

- Spill Response Program is coordinated by the Base Civil Engineer.
- Trash and non-hazardous solid waste is disposed of by an outside contractor.
- Natural gas is the primary heating fuel at the Base.
- Outside pole transformer leaked at Building 1013. Spill cleaned up by Oklahoma Gas & Electric.
- Subsequent to the transformer leak, all transformers and compressors have been investigated for PCBs. And those containing PCBs were taken out of service and replaced (Appendix F).
- Oil/water separators are periodically pumped by a contractor. The o/w separators discharge to the sanitary sewer system.
- Contractor provided pest management services (Appendix G).

- Appendix E contains sample analytical data on wastewater sampling as required by the Federal Categorical Industrial Wastewater Discharge Permit held by the Base.

- Between 1968 and 1971, up to 5000 gallons of AVGAS spilled from a tank truck onto a paved parking lot located south-southeast of Building 1007. The AVGAS entered a nearby drainage ditch and exited the Base via the storm sewer system. Neither residual fuel nor stress vegetation is evident in the spill area.

- During 1956-1957, an FTA was located at an indeterminate point in the now open area bounded by Buildings 1001, 1009, and 1010. Training burns, held only twice, involved dousing a B-29 fuselage with a single drum (55 gallons) of MOGAS and igniting it. Any remains of this FTA may have been removed during the construction of Building 1009. There is no stressed vegetation or other visible evidence of contamination in this area.

V. CONCLUSIONS

Information obtained through interviews with Base personnel, reviews of records, and field observations was used to identify possible spill/disposal sites on the Base property. No sites that exhibit the potential for contaminant presence were identified.

VI. RECOMMENDATIONS

The Preliminary Assessment indicated that there are no sites where contamination has the potential to exist. As a result, no additional work under the Installation Restoration Program is needed.

GLOSSARY

ALLUVIUM DEPOSITS - detrital deposits resulting from the operations of modern rivers, thus including the sediment laid down in river beds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries.

ANTICLINE - A fold in rocks that is convex upward or had such an attitude at some stage of development.

AQUIFER - Stratum or zone below the surface of the earth capable of producing water; as from a well.

AXIAL PLANE - A plane that intersects the crest or trough of a fold in such a manner that the limbs or sides are more or less symmetrically arranged with reference to it.

CONTAMINANT - As defined by Section 101 (33) of SARA shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such organisms or their offsprings, except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress).

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act and shall not include natural gas of pipeline quality or mixtures of natural gas and such synthetic gas.

NOTE: Petroleum products are covered in other regulations. Wastes from petroleum products do not become RCRA hazardous wastes unless they fall under any of the USEPA guidelines for identifying Hazardous wastes:

(1) Listed hazardous wastes from certain specific and non-specific sources.

(2) Listed acutely hazardous wastes.

(3) Listed wastes that contain materials and products based on the criteria for toxicity.

(4) Wastes that meet any of four characteristics of hazardous waste - i.e. ignitability, reactivity, corrosivity, and extraction procedure toxicity (EP toxicity).

CONTAMINATION - The existence of biological, radiological, chemical, or other substances which have been identified as, or may present, a hazard to health or may render some portion of the environment unsuitable for use.

CRITICAL HABITAT - As defined by the U.S. Department of Commerce and U.S. Department of Agriculture; the specific areas within the geographic range of a species that are essential for the preservation of that species and that may require special protection.

CROSS-BEDDED - an arrangement of laminations of strata transverse or oblique to the main planes of stratification of the strata concerned; inclined, often lenticular, beds between the main bedding planes; found only in granular sediments.

DELTAIC COMPLEX - sequence of sedimentary rocks that were deposited in a system of terrestrial river deltas; characteristic sedimentary structures include lenticular river channels, bars, etc.

DOWNGRADIENT - Hydraulically downslope direction of groundwater flow.

ENDANGERED SPECIES - Plant or wildlife species designated as endangered by the U.S. Fish and Wildlife Service.

FAULT ZONE - A fault instead of a single fracture may be a zone hundreds, even thousands, of feet wide containing numerous interconnecting small faults.

FRACTURE - Breaks in rocks due to intense folding and faulting.

GEOSYNCLINE - A large troughlike depression in the earth's surface containing masses of sedimentary and volcanic rocks.

GROUNDWATER - That part of the subsurface water which is the zone of saturation.

HAZARD ASSESSMENT RATING METHODOLOGY (HARM) - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health and environmental impacts.

HAZARD ASSESSMENT SCORE (HAS)- The score developed by utilizing the Hazard Assessment Rating Methodology.

HAZARDOUS WASTE - A solid or liquid waste that because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

(a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, or

(b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

INSTALLATION RESTORATION PROGRAM (IRP) - The DoD program for identifying the location of and releases of hazardous materials from past disposal sites and minimizing their associated hazards to public health.

LEACHITE - A lining agent installed to prevent the downward migration of contaminants; as a leachite liner in a solid waste landfill to prevent the downward migration of leachate into the underlying soil or water table.

LENTICULAR SAND BAR - an approximately double convex-shaped body of sand built up to or near to the surface of the water by currents in a river or by wave action in coastal waters.

LITHOLOGIC - referring to the physical character of a rock, generally as determined megascopically or with the aid of a low-power magnifier.

LOAM - A soil composed of a mixture of clay, silt, and organic matter.

MIGRATION - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

NATURAL AREA - Designated areas with critical habitat or endangered species protected from human exploitation by federal or state laws.

NET PRECIPITATION - Total precipitation minus evaporation.

OVERBURDEN - material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials, ores, or coal, especially those deposits that are mined from the surface by open cuts.

PERMEABILITY - Capacity of a rock, soil, or unconsolidated sediment to transmit a fluid over a given period of time.

PERMIAN - the last of seven periods of the Paleozoic Era; also the system of rocks deposited during that period.

PHYSIOGRAPHIC PROVINCE - Region of similar structure and climate that has had a unified geomorphic history.

PLUME - The three dimensional areal extent both vertical and horizontal of migrating contaminants; as in groundwater, the areal vertical and horizontal concentrations within an aquifer of migrating contaminants.

SAND CHANNELS - lenticular-shaped sedimentary structures composed of unconsolidated sand and/or lithified sandstone. These structures represent the terrestrial routes of ancient streams.

SEDIMENTARY ROCK - rock formed by the accumulation of sediment in water (aqueous deposits) or from air (eolian deposits). A characteristic feature of sedimentary deposits is a layered structure known as bedding or stratification.

STRATIGRAPHY - The arrangement of rocks in layers or strata.

SURFACE WATER - Water exposed on ground surface (i.e., lakes, streams, rivers, etc.).

SWALE - A low-lying or depressed and often wet stretch of land.

SYNCLINE - A fold in rocks in which the strata dip inward from both sides of the axis.

TERRACE DEPOSITS - sedimentary deposits commonly consisting of unconsolidated gravel, sand, silt, and clay that were deposited along the flood plains of ancient streams. The courses of present streams have cut into these deposits exposing them as upland terraces.

TOXICITY - A relative property of a chemical agent; refers to a harmful effect on some biologic mechanism and the condition under which this effect occurs.

UPGRADIENT - A direction that is hydraulically upslope.

WATER TABLE - The upper limit of the portion of the ground wholly saturated with water.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

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Wood, P. R. and L. C. Burton. Ground-Water Resources Cleveland and Oklahoma Counties. Circular 71. Norman, Oklahoma: Oklahoma Geological Survey, 1968.

Appendix A

Resumes of Search Team Members

TRACY CHARLES BROWN
Research Associate
(Environmental R&D)

QUALIFICATIONS

Environmental Compliance, Regulatory Analysis, Environmental Investigation/Remediation, and Assessment/Mitigation of Adverse Environmental Impacts

Under the U.S. Department of Defense, Installation Restoration Program (IRP) and the U.S. Department of Energy, Hazardous Waste Remedial Actions Program (DOE-HAZWRAP) [Martin Marietta Energy Systems, Inc.], participated in a Preliminary Assessment (PA) aimed at identifying hazardous waste disposal sites at the Mansfield-Lahm Air National Guard Base in Mansfield, Ohio.

Substantially revised and amended the Spill Prevention, Control, and Countermeasures (SPCC) Plan for the Y-12 nuclear weapons plant (U.S. Department of Energy/Martin Marietta Energy Systems, Inc.) Led the research, regulatory analysis and compliance, planning, organizational, and writing aspects of the project and coordinated these with the concurrent engineering inspection and certification activities of a subcontractor.

Performed a variety of environmental impact assessment and mitigation activities focusing on cultural and historic resources.

Research and Information Skills

Demonstrated strong scientific investigation, research, and development skills on federally funded projects. Adept at collecting information and data through field observations, surveys, and library resources; keeping detailed, three-dimensional records; compiling data; and focusing on details. Proficient at research design; foreseeing and solving research-related problems; comparing, analyzing, and synthesizing information; and attaining objectives.

Communications and Advising Skills

Experienced writer/editor. Authored a combined total of nearly thirty environmental documents, training manuals, scientific reports, and journal articles. Expert at advising, gathering information through interviews, and consulting with specialists.

Knowledge Areas

Familiar with federal regulations under the Clean Water Act, the Resource Conservation and Recovery Act (RCRA), and the Toxic Substances Control Act (TSCA). Geology (thirty-two course hours including Environmental Geology and Geomorphology), general biology, human skeletal biology, and archaeology/anthropology (environmental impact assessments; cultural resource management; field surveying, sampling, and excavation strategies; mapping; using topographic maps, USDA Soil surveys, and aerial photographs).

EDUCATION

M.A., University of Tennessee, Knoxville, 1982.

B.A., University of Tennessee, Knoxville, 1976
(with Highest Honors).

Austin Peay State University, 1971-1973.

PUBLICATIONS AND PROFESSIONAL PAPERS

Complete list available upon request.

REFERENCES

Available upon request.

JACK DENTON WHEAT
Geologist/Hydrogeologist

EDUCATION

B.S. Geology - Tennessee Technological University

Seminar - Types of radioactive nuclides and the transmitters of radioactive contaminants.

Seminar - RCRA/CERCLA treatment alternatives for hazardous waste.

EXPERIENCE

Geologist/Hydrogeologist, Science & Technology, Inc., 1988 - Present

Performed Preliminary Assessments (PA) for the Department of Defense Installation Restoration Program (IRP). Reviewed and evaluated the geology and hydrogeology of Air National Guard bases to determine the susceptibility of principal groundwater aquifers to contamination from surface pollutants. Analyzed RCRA regulations to determine their relationship to the Department of Defense Hazard Assessment Rating Methodology (HARM). Prepared maps and major sections of text for the final PA reports.

Assisted with revising the Spill Prevention, Control, and Countermeasures (SPCC) Plan for the Y-12 nuclear weapons plant in Oak Ridge, Tennessee.

Geological Assistant, Robert Stansfield Consulting Geologist, 1987

Installed monitoring wells at EPA Superfund sites and private company facilities. Followed OSHA health and safety standards and EPA standards for postdrilling decontamination of site equipment during monitoring well construction.

Field Hydrogeologist, Oak Ridge National Laboratory (ORNL), February 1987 - May 1987

Logged soil cuttings in the field and collected soil samples at specified intervals for soil borings at SWSA 6 and along the proposed DOE - Bethel Valley LLW pipeline route. Installed monitoring wells at SWSA 6 and selected LLW borings

to evaluate potential ground water contamination. Supervised on-site drilling procedures and personnel safety requirements. Compiled individual LLW boring reports, which included soil sample descriptions, zones of groundwater saturation, and monitoring well schematic logs. For the ORNL Environmental Sciences Division, developed a work plan evaluating the groundwater conduction potential of pipe trench back fill.

Consulting Petroleum Geologist,
1980 - 1986

Logged samples of well cuttings collected during exploration drilling of oil and natural gas wells. Supervised on-site drilling procedures that included the cementing of surface casing to prevent the contamination of groundwater aquifers, and the construction of lined retaining pits as a remediation measure for potential oil spills and/or to prevent the release of drilling fluids into the environment. Compiled exploration drillsite reports that included sample descriptions, descriptions of penetrated oil or gas payzones and the potential of these payzones to produce commercial oil or natural gas. Compiled geologic reports for selected areas. These reports covered general geology, formation stratigraphy, potential payzones for oil or natural gas, and geologic maps including structure contours and isopachs. Drafted maps showing previously drilled or permitted locations. Analyzed geophysical logs to evaluate oil and natural gas payzones.

Geologist, Petroleum Development Corporation,
1977 - 1980

Logged samples of well cuttings collected during exploration drilling of oil and natural gas wells. Supervised installation and cementing of surface casing. Prepared geologic maps to select areas for oil and natural gas exploration. Drafted maps showing previously drilled or permitted locations. Analyzed geophysical logs to evaluate oil and natural gas payzones.

GEOLOGICAL REGISTRATION

Licensed professional geologist, State of North Carolina.

RAY S. CLARK
Civil/Environmental Engineer

EDUCATION

Graduate Courses (Environmental Engineering), The University of Tennessee, Knoxville, Tennessee.

B.S. Degree (Civil Engineering/Environmental Engineering Emphasis), The University of Tennessee, Knoxville, Tennessee.

RCRA/CERCLA Seminar - Treatment Alternatives for Hazardous Waste.

EXPERIENCE

Civil/Environmental Engineer, Science & Technology, Inc., Oak Ridge, Tennessee, 1988 - Present.

Working under the U.S. Department of Defense, Installation Restoration Program (IRP) and the U.S. Department of Energy, Hazardous Waste Remedial Action Program (HAZWRAP) [Martin Marietta Energy Systems, Inc.], participated in Preliminary Assessment (PA) record searches aimed at identifying hazardous waste disposal sites on Air National Guard Bases in Tennessee and Ohio. Reviewed base civil engineering, environmental, and historical documents relevant to hazardous waste generation, storage, treatment, and disposal; PCB - contaminated items; environmental incidents; and the chemical eradication of pests. Surveyed and inventoried data on underground storage tanks and oil/water separators. Examined aerial photographs, performed field surveys, and participated in interviews with base personnel as part of a comprehensive effort to assess past, on-base hazardous waste disposal practices and to identify/document potential past hazardous waste disposal sites. Contacted local, state, and federal agencies to obtain additional data pertinent to using the United States Air Force's Hazard Assessment Rating Methodology (HARM). Rated potential hazardous waste disposal sites using the HARM. Coauthored the PA reports.

Assisted with revising the Spill Prevention, Control, and Countermeasures (SPCC) Plan for the Y-12 nuclear weapon plant (Oak Ridge), one of the nation's largest and most physically complex defense research and development facilities.

Technician, Clark Drilling Services, Knoxville, Tennessee, 1980-1988.

Installed and developed hazardous waste monitoring wells. Conducted on-site inspections of monitoring wells.

PROFESSIONAL ORGANIZATIONS

American Society of Civil Engineers

Appendix B

Outside Agency

Contact List

OUTSIDE AGENCY CONTACT LIST

Oklahoma Department of Wildlife Conservation
1801 North Lincoln
Oklahoma City, OK 73103
(405) 521-4601

Oklahoma Geological Survey
830 Van Veet Oval
Norman, OK 73019
(405) 325-3031

Oklahoma Water Resources Board
100 NE Tenth
Post Office Box 53585
Oklahoma City, OK 73512
(405) 271-2555

U.S. Department of Agriculture
Soil Conservation Service
100 W. Wilshire, Suite 223-A
Oklahoma City, OK 73116
(405) 843-5031

National Weather Service
Weather Station #13976
Post Office Box 59997
Oklahoma City, OK 73159
(405) 685-5759

Department of Airports
Post Office Box 59937
Oklahoma City, OK 73159
(405) 681-5311

Appendix C

USAF Hazard Assessment

Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques at DoD facilities. One of the actions required under this program is to:

> Develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the U.S. Air Force has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the Preliminary Assessment phase of the Installation Restoration Program.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist The National Guard in setting priorities for follow-up site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazard waste present in sufficient quantity) and (2) potential for migration exists. A site may be deleted from ranking consideration on either basis.

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most

likely routes of contamination and worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors presented in Figure I.1 of this document. The site rating form and the rating factor guidelines are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contamination migration, and (4) any effort that was made to contain the waste resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score

if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score while scores for solids are reduced.

The pathways category rating is based on evidence of contaminant migration along one of three pathways: surface water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well-managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the score for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE _____

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft. of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Groundwater use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by groundwater supply within 3 miles of site		6		
		Subtotals	_____	_____

Receptors subscore (100 x factor score subtotal/maximum score subtotal) _____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) _____

2. Confidence level (C = confirmed, S = suspected) _____

3. Hazard rating (H = high, M = medium, L = low) _____

Factor Subscore A (from 20 to 100 based on factor score matrix) _____

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

_____ x _____ = _____

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

_____ x _____ = _____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore _____

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Distance to nearest surface water		3		
Net precipitation		6		
Surface erosion		3		
Surface permeability		6		
Rainfall intensity		3		
Subtotals	____			____

Subscore (100 x factor score subtotal/maximum score subtotal) _____

2. Flooding

Flooding		1		

Subscore (100 x factor score/3) _____

3. Groundwater migration

Depth to groundwater		3		
Net precipitation		6		
Soil permeability		3		
Subsurface flows		3		
Direct access to groundwater		3		
Subtotals	____			____

Subscore (100 x factor score subtotal/maximum score subtotal) _____

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore _____

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors _____
Waste Characteristics _____
Pathways _____

Total _____ divided by 3 = _____
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

_____ x _____ = _____

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- Verbal reports from interviewer (at least 2) or written information from the records
- Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- No verbal reports or conflicting verbal reports and no written information from the records
- Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels			
	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
	S	C	H
60	M	C	M
	L	S	M
	L	C	L
50	M	S	H
	S	C	M
	S	S	H
	M	S	M
40	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- Confirmed confidence levels (C) can be added.
- Suspected confidence levels (S) can be added.
- Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- Wastes with the same hazard rating can be added.
- Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCH + SCH = LCH if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCH designation (60 points). By adding the quantities of each waste, the designation may change to LCH (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical state	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-8-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

Appendix D

Subsurface Explorations

COMPOSIT SQUADRON OPERATION TELECOMMUNICATION FACILITY
OKLAHOMA AIR NATIONAL GUARD
OKLAHOMA CITY, OKLAHOMA

SCOPE

On March 26, 1984 we conducted sub-surface explorations on the site of the above proposed project. These explorations consisted of drilling 3 test borings to the depths shown on the accompanying logs, making certain field tests and securing samples for subsequent laboratory tests as herein after reported. Location of the borings are shown on Plate "A", attached.

The quantity and type of tests, and the number of borings and their respective depths are in general concurrence with the specific requests and limitations stated by Mr. Bob Hope.

FIELD INVESTIGATION

Test borings were dry-drilled with a truck-mounted Simco rotary drilling unit equipped with a 20-foot derrick, with a 4-inch diameter continuous flight auger; other equipment included special apparatus for sampling and field testing. For accurate sampling, the cuttings were removed from the boring for inspection at 12-inch (maximum) intervals of penetration. In order to estimate the shear strengths of the soils in their natural state, A.S.T.M. D-1586 Standard Penetration Tests were driven as follows:

BORING NO.	DEPTH RANGE	NO. OF BLOWS FOR ONE FOOT PENETRATION*	% MOISTURE	UNIT DRY WEIGHT #/CU.FT.
1	2.0' - 3.0'	14 (8 + 6)	5.4	119.3
1	7.5' - 9.0'	35 blows to seat	12.6	110.0
2	2.5' - 3.5'	19 (8 + 11)	20.0	107.8
2	8.0' - 9.5'	50 blows to seat	-----	-----
3	2.0' - 3.0'	16 (6 + 10)	20.6	105.5
3	6.0' - 7.5'	40 blows for 7"	14.9	112.4

*Figures in parentheses denote the number of blows for each 6 inches of penetration.

Holes were left open for as long as possible for ground water observations and then back filled. Samples were placed in water tight protective containers and labeled for transport to the laboratory.

LABORATORY TESTING

In order to properly classify the soils encountered and to aid in the evaluation of their engineering properties, Atterberg (liquid and plastic) limits and moisture content tests were performed on 3 typical soil horizons. One (1) near surface soil that would conceivably affect paving and slabs on grade was further tested for sieve analysis and determination of Oklahoma Subgrade Index Value. As an aid in evaluating the ASTM penetration tests and in order to better estimate the bearing capacity of these soils, 1 Unconfined Test was performed on 1 split spoon sample obtained in the Gow spoon sampler. The Stress-Strain relationship is shown on Plate "UCC-2-1". The AASHO Classification System illustrated in the upper chart is described on Plate "CS-1", whereas the Unified System, lower chart, is explained on Plate "CS-2".

Visual (and laboratory) classifications and general descriptions of the soils encountered, together with numerical values of the test results are shown on the boring logs, Plates "B" through "D". Plate "T-1" is included to show our interpretation of the terms used.

DISCUSSION AND CONCLUSIONS

In this investigation, a total of 3 borings were drilled. The soils encountered consist essentially of a fairly high plasticity silty clay underlain by a hard shale. These soils are considered as fairly active, consequently, they can be expected to undergo considerable volume change with moisture variation.

Water was not observed in any of the borings at the time of drilling. However, due to possible seasonal variations in water level, it is possible that water may be encountered in excavations during construction. Because of this possible seasonal variation, we cannot assume responsibility for construction difficulties experienced during construction or for further operational problems due to elevation or volume of water encountered.

Shallow footings may be significantly effected by the volume changes associated with these active soils. Therefore, we would recommend that a

foundation system consisting of grade beams supported on drilled piers cast to bear approximately 10.0 feet below the existing grade, be utilized. The footings at this depth will be in the underlying shale and may be designed for allowable loads of about 10,000 (ten thousand) pounds per square foot.

All piers should be adequately reinforced and the reinforcement extended into the grade beams that will be supported on the piers. Piers may be underreamed if possible. Underreaming operation, however, may be difficult or even economically impossible with common pier hole equipment.

Grade beams cast directly on natural soils are likely to be subjected to significant uplift forces. They should be at least 3 to 4 inches over underlying soils by casting them over cardboard void boxes or other suitable means. In any case, we would recommend that they be strongly reinforced for both positive and negative mid-span bending moments to adequately distribute both wall loads and uplift forces.

Similarly, slab-on-grade may be subjected to some undesirable movement. However, due to the rather moist condition of the upper soils, any further amount of swelling is anticipated to be near negligiable. Therefore, if the soil present moisture content can be maintained during the construction period, a moderately reinforced slab-on-grade cast over at least 12 inches of granular soil can be utilized.

We would recommend that if any fill is imported to the site that it be of a granular, low plastic nature (Unified Classification GW, GC, SW, SP, SC, or CL with a Plasticity Index less than 12). All fill, areas to receive fill, and natural grades in the structural area and under parking, drives and walks should be compacted to at least 95% of Standard Proctor Density (ASTM D-698) at a moisture content at or slightly in excess of the optimum. This moisture content should be maintained up until the placement of concrete or asphalt, especially in structural areas, to prevent shrinkage and cracking due to drying.

The recommendations and conclusions contained in this report are based on the 3 borings drilled and tests performed. We would point out that there

there may be unknown conditions in existance which differ seriously from those encountered by the test borings. Such conditions, if indeed they exist at all, cannot be and have not been accounted for in this report. Therefore, the descriptions, recommendations, and conclusions contained herein should be considered as generalized applying only to the immediate vicinity of the borings.

If there should be any additional information we can furnish, please advise.

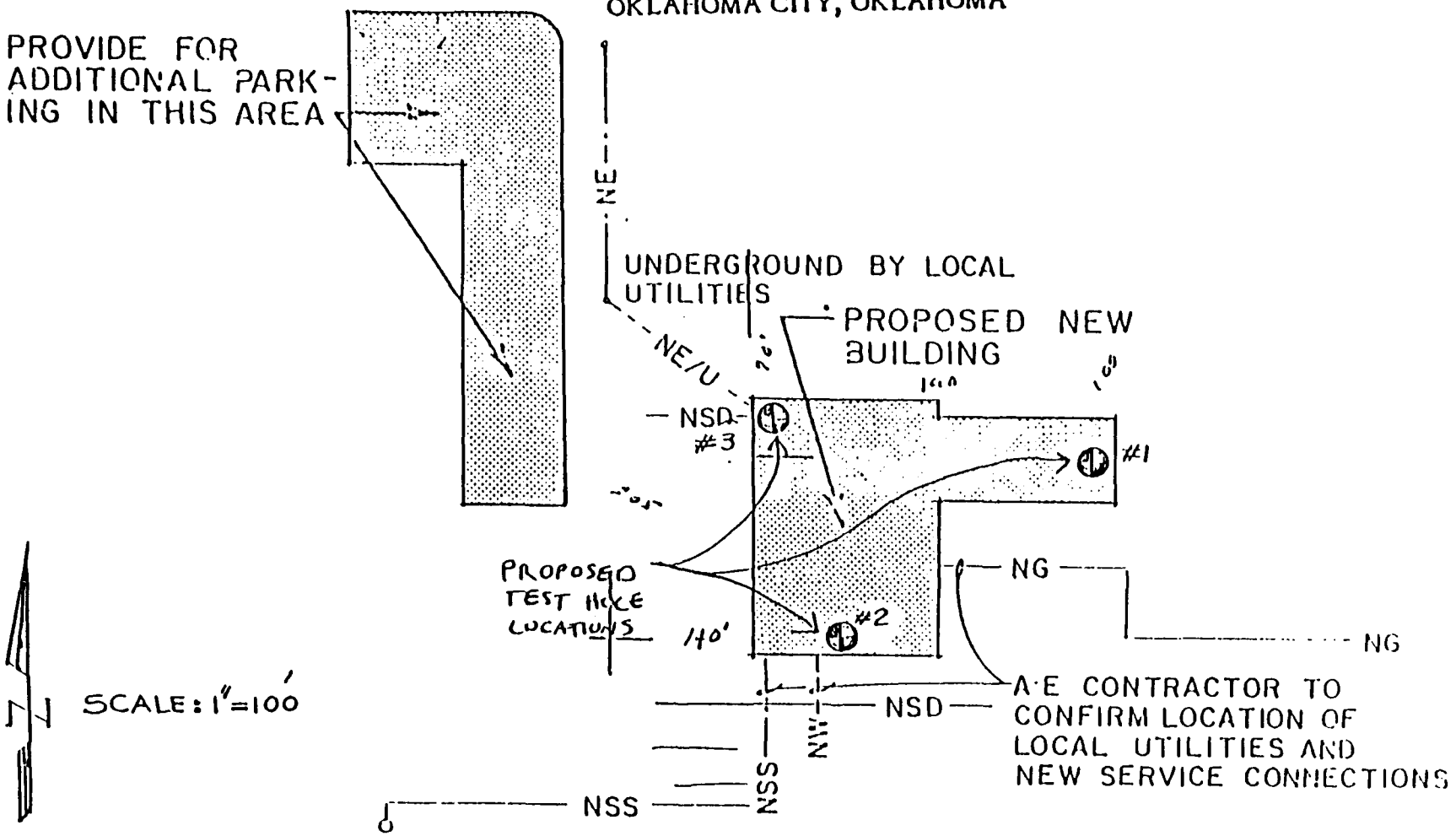
Respectfully submitted,

STANDARD TESTING & ENGINEERING CO.

Perry Soltani, P.E.
Foundations Consultant

PNS:cjg

APPROXIMATE LOCATION OF BORINGS
COMPOSIT SQUADRON OPERATION TELECOMMUNICATION FACILITY
OKLAHOMA AIR NATIONAL GUARD
OKLAHOMA CITY, OKLAHOMA



COMPOSITE SQUADRON OPERATION TELECOMMUNICATION FACILITY
OKLAHOMA AIR NATIONAL GUARD
OKLAHOMA CITY, OKLAHOMA

DEPTH FROM	TO	DESCRIPTIONS AND REMARKS

BORING NO. 1

0.0 - 4" Asphalt.

4" - 2.0' Base.

A.S.T.M. Penetration Test

1.5' - 2.0'	(18 blows to seat)
2.0' - 2.5'	8 blows
2.5' - 3.0'	6 blows
Total	14 blows per one foot penetration

Natural Density	125.7 p.c.f.
Moisture Content	5.4%
Unit Dry Weight	119.3 p.c.f.

2.0' - 5.0' Brown silty clay; moist to very moist; fairly high plasticity; slightly stiff.

Liquid Limit	41
Plastic Limit	16
Plasticity Index	25
Moisture Content	19.0%
Percent Passing:	
No. 10	100.0
No. 40	90.5
No. 200	81.1
Classification:	
Unified	CL

5.0' - 7.0' Reddish-brown silty clay; moist to very moist; fairly high plasticity; fairly hard to hard.

Liquid Limit	43
Plastic Limit	16
Plasticity Index	27
Moisture Content	19.3%
Classification:	
Unified	CL

7.0' - 15.0' Shale; moist; medium plasticity; hard.

Liquid Limit	34
Plastic Limit	17
Plasticity Index	17
Moisture Content	15.6%
Classification:	
Unified	CL

COMPOSIT SQUADRON OPERATION TELECOMMUNICATION FACILITY
OKLAHOMA AIR NATIONAL GUARD
OKLAHOMA CITY, OKLAHOMA

DEPTH FROM	TO	DESCRIPTIONS AND REMARKS

A.S.T.M. Penetration Test

7.5' - 9.0' 35 blows to seat

Natural Density 123.9 p.c.f.
Moisture Content 12.6%
Unit Dry Weight 110.0 p.c.f.

BORING NO. 2

0.0 - 4" Asphalt.

4" - 2.0' Dark brown silty clay; very moist; fairly high plasticity; stiff.

Moisture Content 24.9%

2.0' - 5.0' Brown silty clay; moist to very moist; fairly high plasticity; stiff to very stiff.

Moisture Content 20.5%

A.S.T.M. Penetration Test

2.0' - 2.5' (5 blows to seat)
2.5' - 3.0' 8 blows
3.0' - 3.5' 11 blows
Total 19 blows per one foot penetration

Natural Density 129.4 p.c.f.
Moisture Content 20.0%
Unit Dry Weight 107.8 p.c.f.

Unconfined Compression Test

2.5' - 3.5' Maximum Stress 3.5 T.S.F. at 7.0% Strain

5.0' - 7.0' Red silty clay; moist to very moist; fairly high plasticity; fairly hard to hard.

Moisture Content 19.1%

7.0' - 15.0' Shale, 2" loose hard material at 12'; moist; medium plasticity; hard.

Moisture Content 15.4%

A.S.T.M. Penetration Test

8.0' - 9.5' 50 blows to seat

PLATE "C"

LOG OF BORINGS

COMPOSIT SQUADRON OPERATION TELECOMMUNICATION FACILITY
OKLAHOMA AIR NATIONAL GUARD
OKLAHOMA CITY, OKLAHOMA

DEPTH FROM	TO	DESCRIPTIONS AND REMARKS

BORING NO. 3

0.0 - 4" Asphalt.

4" - 5.0' Brown silty clay; moist; fairly high plasticity; stiff.

Moisture Content 17.3%

A.S.T.M. Penetration Test

1.5' - 2.0'	(5 blows to seat)
2.0' - 2.5'	6 blows
2.5' - 3.0'	10 blows
Total	16 blows per one foot penetration

Natural Density	127.2 p.c.f.
Moisture Content	20.6%
Unit Dry Weight	105.5 p.c.f.

5.0' - 6.0' Red silty clay; moist to very moist; fairly high plasticity; fairly hard to hard.

Moisture Content 19.8%

6.0' - 15.0' Shale; moist; medium plasticity; hard.

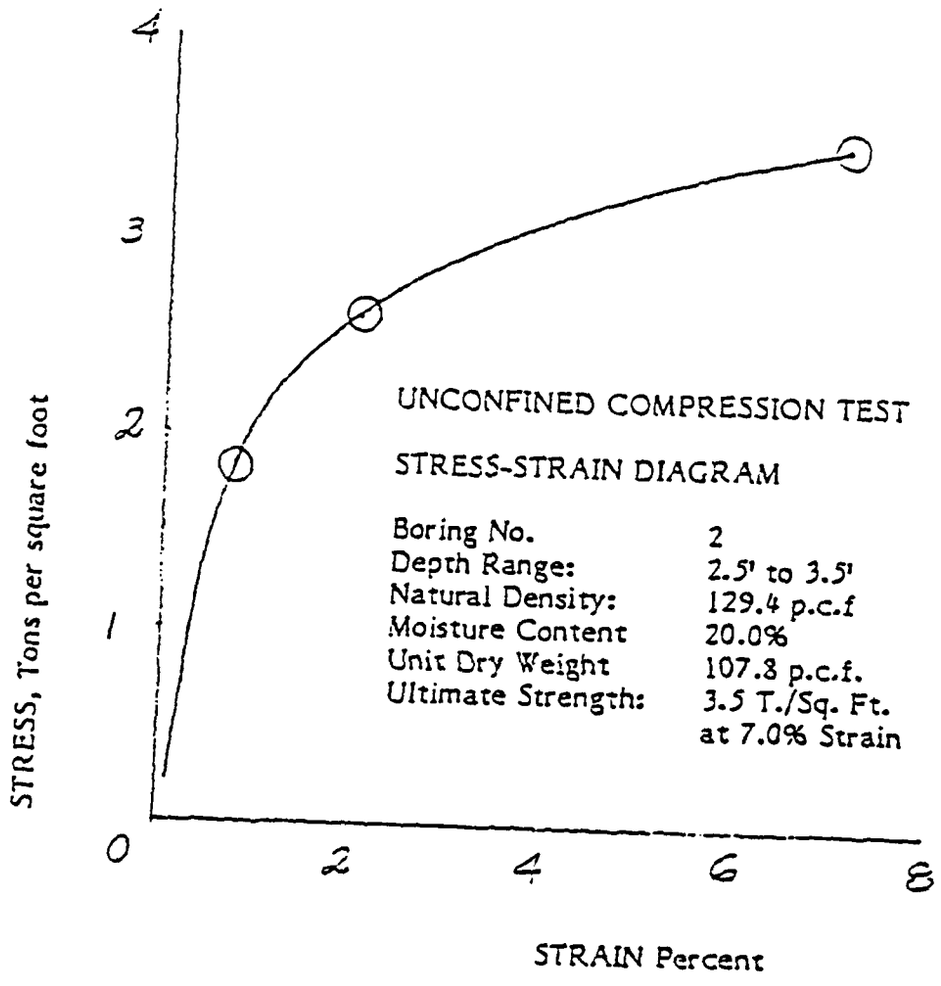
Moisture Content 15.5%

A.S.T.M. Penetration Test

6.0' - 7.5' 40 blows for 7 inches

Natural Density	129.2 p.c.f.
Moisture Content	14.9%
Unit Dry Weight	112.4 p.c.f.

PLATE "D"


4
3
2
1
0
2
4
6
8
STRESS, Tons per square foot
STRAIN Percent
UNCONFINED COMPRESSION TEST
STRESS-STRAIN DIAGRAM
Boring No. 2
Depth Range: 2.5' to 3.5'
Natural Density: 129.4 p.c.f
Moisture Content 20.0%
Unit Dry Weight 107.8 p.c.f.
Ultimate Strength: 3.5 T./Sq. Ft.
at 7.0% Strain

UCC-2-1

FORM :9

310 NORTH KLEIN
P.O. DRAWER 60268
PHONES: 232-5211
232-4666

OKLAHOMA TESTING LABORATORIES

REGISTERED PROFESSIONAL ENGINEERS—CHEMISTS
Oklahoma City, Okla. 73146

Lab. No. 3238 July 15, 1988 Acct. No. _____

REPORT ON : SUBSURFACE INVESTIGATION

Gulley & Affiliates
3022 N.W. Expressway
Suite 506
OKC, OK 73112

RE: Project: 41568 Construct Power Check Pad
Will Rogers Air National Guard Base
OKC, OK

Gentlemen:

On June 29, 1988 we drilled two test holes, on the above site, at locations designated by you, to determine the nature of the subsurface strata. The locations of the holes are shown on the attached sketch. The logs of the holes are shown below.

The drilling was done using a rotary drilling rig. No circulating water or drilling fluid was used. The penetration tests were made by driving a two inch O.D. split spoon sampler with a one hundred and forty pound weight dropped through a distance of thirty inches.

Hole No. 1 was located 20' west and 5' south of the designated spot because of an overhead electric line.

Hole NO. 1
0.0'- 2.5' Brown silty clay, damp, very firm
2.5'- 7.0' Red silty caly, damp, hard
Penetration Tests
1.5' to 2.5' - 22 blows (8)
5.0' to 6.0' - 40 blows (10)

Hole NO. 2
0.0'- 4.0' Brown silty clay, damp, firm
4.0'- 7.0' Red silty clay, damp, hard
Penetration Tests
1.5' to 2.5' - 14 blows (7)
5.0' to 5.5' - 50 blows for 0.5' penetration (20)

The numbers in parenthesis in the penetration data were the number of blows required to seat the sampler for six inches.

For a foundation or footing system bearing about 1.5' below the existing surface, we would suggest that the loading at Hole No. 1 should not exceed five thousand pounds per square foot at three thousand pounds per square foot at Hole No. 2.

For spot or spread footings bearing about five feet below the existing surface, we would suggest that the loading not exceed ten thousand pounds per square foot. In drilling deeper holes in this general area, it has been noted that when the hard clay strata is encountered, it has remained hard with additional depth.

The surface strata and the red clay strata as encountered at both locations, was similar. Samples for permeability tests were taken from the strata at Hole No. 2. The tests results are shown below.

FORM 19

310 NORTH KLEIN
P.O. DRAWER 60268
PHONES: 232-5211
232-4666

OKLAHOMA TESTING LABORATORIES

REGISTERED PROFESSIONAL ENGINEERS—CHEMISTS
Oklahoma City, Okla. 73146

Lab. No. 3238 July 15, 1988 Acct. No. _____

REPORT ON : SUBSURFACE INVESTIGATION

RE: Project: 41568 Construct Power Check Pad
Will Rogers Air National Guard Base
OKC, OK

A. Brown silty clay
Coefficient of permeability,cms/sec. 6.4×10^{-9}

B. Red silty clay
Coefficient of permeability,cms/sec. 4.2×10^{-9}

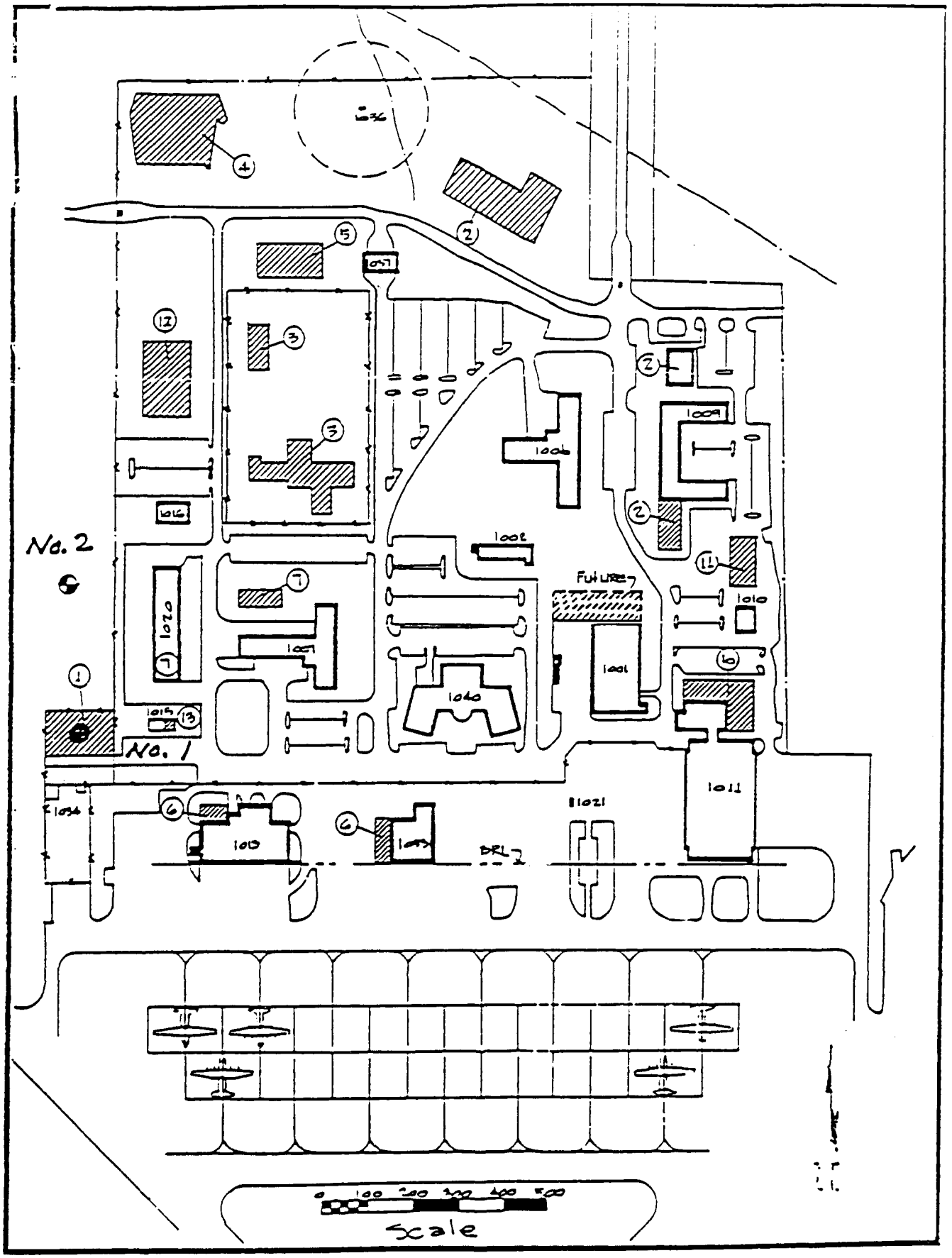
Sincerely yours,

OKLAHOMA TESTING LABORATORIES

M.A. Witte
President

MAW:dm

Exhibit 3.75m: Site Alternative No. 7



Appendix E

Base Storm and Sanitary Discharge

BASE STORM AND SANITARY DISCHARGE

Wastewater discharged into the sanitary sewer at the Base is treated at the Sewage Treatment Plant. The treatment plant is located approximately 2 miles south of the Base and is operated by the Oklahoma City Water Department.

Stormwater and liquids entering the storm sewer system on the Base are discharged into two drainage ditches at the North end of the Base. One outfall is located approximately 300 feet north of the Main Gate House (Bldg. 1039). However, most of the effluent from the storm sewer system is discharged into the drainage ditch located approximately 100 feet north of Building 1037. These two drainage ditches come together just outside of the Base boundary and their flow continues on to the North Canadian River.

The Oklahoma City Water Department samples waters from the sanitary sewer on a yearly basis and has a complete analysis of the samples done. (See pages E-2+.) The effluent from the storm sewer system at the Base has not been routinely sampled.

[illegible] NATIONAL GUARD
[illegible] 137TH TACTICAL [illegible] WING ANG [illegible]
P O STA 18 WILL ROGERS WORLD AIRPORT
OKLAHOMA CITY, OKLAHOMA 73169

ATTN: 137th Tactical Hospital/SGB 30 July 84

SUBJECT Sewage Sampling

TO USAF Hospital Tinker/SGB – Capt Cornell 734-7844

1. On 10 July 84 sewage sampling was performed using an Iscc Sampler Model 1580. The sampling location was the first manhole 150 feet directly East of the sewage pumping station operated by the Oklahoma City Water Department. This location has three sewer lines feeding into it, one from the North, one from the South, and another from the East. This collection point has all sweage from the Will Rogers Air National Guard base running through it to the pumping station. Sampling was performed from 1500 hrs 10 July to 1500 hrs 11 July. Samples were taken at a time when no aircraft washing operations were being performed. Samples will also be collected during aircraft washing operations and the results will be forwarded to your office.

You will find attached a copy of the results of this sampling. All samples were analyzed by Southwell Labs of Oklahoma City. Please read these results and forward any recommendations to us. Your cooperation will be appreciated.

Christopher D. Heath

Christopher D. Heath, TSgt, OKANG
Bioenvironmental Engineering Division

Atch 1:Laboratory Report

SOUTHWELL LABORATORY
ANALYTICAL & CONSULTING CHEMISTS & TOXICOLOGISTS
JOSEPH R SOUTHWELL
2 S W 13th STREET • P O BOX 25001 • OKLAHOMA CITY, OKLAHOMA 73125 • (AREA CODE 405) 232

: Oklahoma Air National Guard — SAMPLE # 8404865

P O Station 18 Will Rogers World Airport — DATE 7-19-84

Oklahoma City, Oklahoma 73169 — PO# _____

MPLE OF Water Discharge

MPLE ID T. BAer

CERTIFICATE OF ANALYSIS

Purgeable Halogenated Hydrocarbons were analyzed in accordance with Environmental Protection Agency Method.
Halogenated Hydrocarbons analyzed for includes/but not limited to--

trans 1,2 Dichloroethylene	1,2 Dichloroethane
1,1,1 Trichloroethane	Bromodichloromethane
cis & trans 1,3 Dichloropropene	Bromoform
1,1,2,2 Tetrachlorethane	Methylene Chloride
1,1 Dichloroethylene	1,1 Dichloroethane
Chloroform	Carbon Tetrachloride
1,2 Dichloropropane	Trichloroethylene
1,1,2 Trichloroethane	Dibromochloromethane
Tetrachloroethylene	Chlorobenzene

No Halogenated compounds detected at a level greater than 5 ug/L (p

Parameter (Results mg/L)		
pH		7.50
Total Suspended Solids		173
Oil & Greasw		5
Phenols	less than	0.01
Cyanide	less than	0.01
BOD_5		105
COD		260
Hexavalent Chromium	less than	0.01
Tin	less than	0.01
Total Chromium		0.02
Copper		0.04
Iron		2.7

[illegible] STA 19 WILL ROGERS WORLD AIRPORT
OKLAHOMA CITY, OKLAHOMA 73169

[illegible]137th Tac Hosp/SGB 31 Jul 84

[illegible] Sewage Sampling

[illegible] USAF Hosp Tinker/SGB

1. On 16 July 84 sewage sampling was performed using an Isco Sampler Model 1580. [illegible]he sampling location was the same one mentioned in our letter dated 30 July. The [illegible]ampling period was from 0900 hrs 16 July to 0900 hrs 17 July. During this period [illegible]ircraft washing operations were being performed.

2. You will find attached a copy of the results obtained from Southwell Labs of [illegible]klahoma City. If you need any additional information feel free to call me at 686-[illegible]245 or Capt Peter Shanahan our base Civil Engineer at 686-5310. Thanks again for [illegible]our cooperation.

Christopher D. Heath

[illegible]hristopher D. Heath, TSgt, OKANG
[illegible]bioenvironmental Engineering Division

Atch 1:Laboratory Results

SOUTHWELL LABORATORY

ANALYTICAL & CONSULTING CHEMISTS & TOXICOLOGISTS

JOSEPH A SOUTHWELL

S. W 13th STREET · P O. BOX 25001 · OKLAHOMA CITY, OKLAHOMA 73125 · (AREA CODE 405) 232-1966

Oklahoma Air National Guard — SAMPLE # 8404982

P. O. Station 18 Will Rogers World Airport — DATE 7-25-84

Oklahoma City, Oklahoma 73169 — PO# _____

MPLE OF Water Discharge

MPLE ID 24 hour composite sample

CERTIFICATE OF ANALYSIS

Water sample was analyzed for Purgeable Halogenated Hydrocarbons in accordance with Environmental Protection Agency Method 601. These include (but not limited to:

trans 1, 2 Dichlorethylenene	1,1 Dichloroethane
1,2 Dichloroethane	Chloroform
1,1,1 Trichloroethane	Carbon Tetrachloride
Bromodichloro Methane	1,2 Dichloropropane
cis & trans 1,3 Dichloropropene	Trichloroethylene
Bromoform	1,1,2 Trichloroethane
1,1,2,2 Tetrachloroethane	Dibromochloromethane
Methylene Chloride	Tetrachloroethylene
1,1 Dichloroethylene	Chlorobenzene

No.compounds detected at greater than 5 ug/L (ppb)

Parameter (Results mg/L)		
pH		7.50
Total Suspended Solids		138
Oil & Grease		80
Phenols		0.02
COD		600
BOD_5		215
Hexavalent Chromium		0.01
Total Chromium		0.04
Tin	less than	0.01
Iron		2.1
Copper		0.02
Cyanide	less than	0.01

SOUTHWELL LABORATORY

ANALYTICAL & CONSULTING CHEMISTS & TOXICOLOGISTS
JOSEPH R. SOUTHWELL
S. W. 13th STREET • P. O. BOX 25001 • OKLAHOMA CITY, OKLAHOMA 73125 • (AREA CODE 405) 232-1966

OKLAHOMA AIR NATIONAL GUARD
CIVIL ENGINEERING
PO STATION 18, WORLD ROGERS WORLD AIRPORT
OKLAHOMA CITY, OK 73169

SAMPLE # 8404982
DATE 7/25/84
PO# _____

IPLE OF water

IPLE ID 24 composite sample

CERTIFICATE OF ANALYSIS

pH	7.50
Tl. Suspended Solids	138 mg/L
Oil & Grease	80 mg/L
Phenols	.02 mg/L
Chemical Oxygen Demand	600 mg/L
Biological Oxygen Demand (BOD_5)	215 mg/L
Hex. Chromium	.01 mg/L
Tl. Chromium	.04 mg/L
Tin	<.01 mg/L
Iron	2.1 mg/L
Copper	.02 mg/L
Cyanide	<.01 mg/L

(** < means less than)

SOUTHWELL LABORATORY

ANALYTICAL & CONSULTING CHEMISTS & TOXICOLOGISTS

JOSEPH R SOUTHWELL

38 S. W 13th STREET • P O BOX 25001 • OKLAHOMA CITY, OKLAHOMA 73125 • (AREA CODE 405) 232-

O: Oklahoma Air National Guard — SAMPLE # 8405730

Civil Engineering/PO Station 18 — DATE 9/4/84

Will Rogers World Airport, OKC, OK 73169 — PO# DAHA34-84-

AMPLE OF Water

AMPLE ID

CERTIFICATE OF ANALYSIS

One water sample analyzed for volatile halogenated hydro carbons in accordance with Environmental Protection Agency, Method 601.

Three compounds detected:

Methylene Chloride	19.2 ug/l
Chloroform	679 ug/l
1,2 Dichloroethane	Trace, (less than 1.0 ug/l)

pH	7.78
Tl. Suspended Solids	116 mg/L
Oil & Grease	8 mg/L
Phenols	.06 mg/L
Chemical Oxygen Demand	410 mg/L
Biological Oxygen Demand (BOD_5)	161 mg/L
Hexavalent Chromium	<.01 mg/L
Tl. Chromium	.03 mg/L
Tin	<.01 mg/L
Iron	2.40 mg/L
Copper	.06 mg/L
Cyanide	<.01 mg/L

(< means less than)

P.O. BOX 2000,
OKLAHOMA CITY, OKLAHOMA 73125
(405) 222-1966

OK AIR NATIONAL GUARD
PO STATION 19 WILL ROGER
OKLAHOMA CITY, OK 73169
ATTN: FREDY MAPLES - CIVIL ENG

DATE SAMPLED: 1/ 8/86
DATE RECEIVED: 1/ 8/86
DATE REPORTED: 1/17/86

C E R T I F I C A T E O F A N A L Y S I S

IDENTIFICATION: LAB NUMBER 8600799
WATER SAMPLES
#2, SW 104 & MACARTHUR 1 BLOCK WEST
PO #DAHA34-86-4-3131

BIO OXYGEN DEMAND	26
CHEM OXYGEN DEMAND	82
CHROMIUM/HEXAVALENT	< 0.005
COPPER mg/L	< 0.005
CYANIDE mg/L	< 0.005
HYDROCARBON SCAN	+
IRON mg/L	0.02
OIL & GREASE mg/L	3.9
pH	7.61
PHENOLS mg/L	0.14
PHOSPHATE mg/L	0.15
PURGEABLE HALOCARBON	+
TIN	0.1
TL.SUSPENDED SOLIDS	7.3

EPA METHOD 601

COMPONENT	DETECTION LIMIT	AMOUNT DETECTED
BROMODICHLOROMETHANE	0.34	NONE
BROMOFORM	——	NONE
BROMOMETHANE	0.43	NONE
CARBONTETRACHLORIDE	0.14	NONE
CHLOROBENZENE	0.14	NONE
CHLOROETHANE	0.19	NONE
2-CHLOROETHYLVINYLETHER	——	NONE
CHLOROFORM	0.45	NONE
CHLOROMETHANE	2.15	NONE
DIBROMOCHLOROMETHANE	0.14	NONE
1,1-DICHLOROETHANE	0.07	NONE
1,2-DICHLOROETHANE	0.09	NONE
1,1-DICHLOROETHYLENE	0.10	NONE
trans1,2-DICHLOROETHYLENE	0.07	NONE
1,2-DICHLOROPROPANE	0.07	NONE
cis-1,3-DICHLOROPROPYLENE	0.06	NONE
trans-1,3-DICHLOROPROPYLENE	0.07	NONE
METHYLENE CHLORIDE	0.12	NONE
TETRACHLOROETHYLENE	2.0	NONE
1,1,2,2-TETRACHLOROETHANE	2.0	NONE
TRICHLOROETHYLENE	0.07	NONE
1,1,1-TRICHLOROETHANE	0.24	NONE
1,1,2-TRICHLOROETHANE	0.14	NONE
VINYL CHLORIDE	0.51	NONE

[illegible] [illegible]
THE COMPOUNDS LISTED [illegible] AND DERIVATIVES (e.g. METHYLENE [illegible] TRICHLOROETHANE, TETRACHLOROETHYLENE). ANALYSIS BY PURGE AND TRAP SELECTIVE DETECTION GAS CHROMATOGRAPHY HAS DETECTION LIMITS AT TRACE LEVELS.

-

-

PURGEABLE AROMATICS (EPA METHOD 602)

-

BENZENE	5.4	NONE
TOLUENE	5.6	NONE
ETHYLBENZENE	2.7	NONE
O-XYLENE	3.0	NONE
M-XYLENE	2.8	NONE
P-XYLENE	2.9	NONE
O-DICHLOROBENZENE	2.4	*
M-DICHLOROBENZENE	2.1	*
P-DICHLOROBENZENE	2.5	*

*DICHLOROBENZENES OMITTED FROM SAMPLE #2 DUE TO INTERFERENCE BY HYDROCARBON SCAN-KEROSENE.

SAMPLE #2 POSITIVE FOR VOLATILE HYDROCARBON COMPOUNDS. HYDROCARBONS DETECTED ARE THE VOLATILE COMPONENTS OF KEROSENE. THE CONCENTRATION OF FUEL CONTAMINANTS APPROXIMATELY 4.3 ppm.

NOTE: HYDROCARBON SCAN CONCENTRATIONS ARE ONLY AN APPROXIMATION. THE METHOD OF ANALYIS ONLY MEASURES A PORTION OF THE TOTAL (VOLATILE AND NON-VOLATILE) HYDROCARBON CONSTITUENTS OF KEROSENE.

SOUTHWELL LABORATORY
P.O. BOX 25001
OKLAHOMA CITY, OKLAHOMA 73125
(405) 232-1966

OK AIR NATIONAL GUARD
PO STATION 18 WILL ROGER
OKLAHOMA CITY, OK 73169
ATTN: ALAN GAGNON, CIVIL ENGRN

DATE SAMPLED: 10/20/87
DATE RECEIVED: 10/21/87
DATE REPORTED: 10/29/87

CERTIFICATE OF ANALYSIS

IDENTIFICATION: LAB NUMBER 8711618
WATER SAMPLES
24 HOUR SEWER DISCHARGE TAKEN WITH AUTO SAMPLER

PURGEABLE HALOCARBON	*
pH	7.31
TL.SUSPENDED SOLIDS	67.94 mg/L
OIL & GREASE mg/L	44.20
PHENOLS mg/L	0.55
BIO OXYGEN DEMAND	205.08 mg/L
CHEM OXYGEN DEMAND	190 mg/L
SAMPLING CHARGE	-

* COMPOUND	DETECTION LIMIT	AMOUNT DETECTED
CHLOROMETHANE	0.1	NONE
BROMOETHANE	1.2	NONE
VINYL CHLORIDE	2.0	NONE
CHLOROETHANE	0.6	NONE
METHYLENE CHLORIDE	0.2	0.3
1,1, DICHLOROETHYLENE	0.1	NONE
1,1, DICHLORCETHANE	0.1	NONE
CHLOROFORM	0.06	1.2
CARBON TETRACHLORIDE	0.1	NONE
1,2-DICHLOROPROPANE	0.1	NONE
TRICHLOROETHYLENE	0.1	NONE
1,1,2 TRICHLOROETHANE	0.1	NONE
DIBROMOCHLOROMETHANE	0.1	NONE
TETRACHLOROETHYLENE	0.1	NONE
CHLOROBENZENE	0.3	NONE
1,2 DICHLOROETHYLENE	0.1	NONE
1,2 DICHLOROETHANE	0.1	NONE
1,1,1 TRICHLOROETHANE	0.1	NONE
BROMODICHLOROMETHANE	0.2	NONE
BROMOFORM	0.2	NONE
1,1,2,2 TETRACHLOROETHANE	0.1	NONE
2-CHLOROETHYL VINYL ETHER	0.2	NONE
TRICHLOROFLUOROMETHANE	0.2	NONE
DICHLOROPROPYLENE	0.2	NONE

-
ALL CONCENTRATIONS ug/l EQUIVALENT TO PARTS-PER-BILLION
NONE = NONE DETECTED GREATER THAN STATED DETECTION LIMIT.
DETECTION LIMITS BASED ON SYSTEM RESPONSE TO SPIKED WATER ANALYSIS.
-
WATER ANALYSIS IN ACCORDANCE WITH E.P.A. METHOD 601 FOR PURGEABLE

OK AIR NATIONAL GUARD
5624 AIR GUARD DRIVE
OKLAHOMA CITY, OK 73179
ATTN: MAJOR ALAN GAGNON

DATE SAMPLED: 3/10/88
DATE RECEIVED: 3/10/88
DATE REPORTED: 3/23/88

C E R T I F I C A T E O F A N A L Y S I S

IDENTIFICATION: LAB NUMBER 8807572
WATER SAMPLES
24 HOUR COMPOSITE SEWER DISCHARGE

BIO OXYGEN DEMAND mg/L	179.4
CHEMICAL OXYGEN DEMAND mg/L	400
OIL & GREASE mg/L	11.9
PH	7.57
PHENOLS mg/L	0.1
TOTAL SUSPENDED SOLIDS mg/L	176
PURGEABLE HALOCARBON	*
AUTOMATIC SAMPLER (24 HRS.)	

PURGEABLE HALOCARBON:

COMPOUND	DETECTION LIMIT	AMOUNT DETECTED
CHLOROETHANE	0.1	NONE
METHYLENE CHLORIDE	0.1	2.2
TRICHLOROFLUOROMETHANE	0.1	0.2
1,1-DICHLOROETHYLENE	0.1	NONE
1,1-DICHLOROETHANE	0.1	NONE
TRANS-1,2-DICHLOROETHYLENE	0.1	0.3
CHLOROFORM	0.1	4.2
1,2-DICHLOROETHANE	0.1	NONE
1,1,1-TRICHLOROETHANE	0.1	NONE
CARBON TETRACHLORIDE	0.1	NONE
BROMODICHLOROMETHANE	0.1	0.2
1,2-DICHLOROPROPANE	0.1	NONE
TRANS-1,3-DICHLOROPROPYLENE	0.1	NONE
TRICHLOROETHYLENE	0.1	0.2
CIS-1,3-DICHLOROPROPYLENE	0.1	NONE
1,1,2-TRICHLOROETHANE	0.1	NONE
DIBROMOCHLOROMETHANE	0.1	NONE
CHLOROETHYLVINYL ETHER	0.4	NONE
BROMOFORM	0.4	NONE
TETRACHLOROETHYLENE	0.1	NONE
1,1,2,2-TETRACHLOROETHANE	0.1	NONE
CHLOROBENZENE	0.2	NONE

ALL AMOUNTS IN ug/l EQUIVALENT TO PARTS-PER-BILLION.
NONE = NONE DETECTED GREATER THAN THE STATED DETECTION LIMIT.

SAMPLED BY: SOUTHWELL LABORATORY
SAMPLER: AUTOMATIC SAMPLER, INSTALLED BY
ROB SLINGERLAND AND SAM ALEXANDER
DATE & TIME: 3-10-38 9:00 a.m.-3-11-38 9:00 a.m.(24 HOURS
CHEMIST: GLEN SPECK AND ROB SLINGERLAND
METHOD: EPA-WASTE WATER MANUAL E.P.A. 600/4/70-020

	ANALYSIS DATE		E.P.A. METHOD
BIOCHEMICAL OXYGEN DEMAND	8-11-88	11:15 a.m.	405.1
OIL & GREASE	8-11-88	10:30 a.m.	413.1
PHENOLS	8-11-88	10:45 a.m.	420.1
CHEMICAL OXYGEN DEMAND	8-11-88	9:10 a.m.	410.4
TOTAL SUSPENDED SOLIDS	8-11-88	11:00 a.m.	160.2
PH	8-11-88	9:15 a.m.	150.1
PURGEABLE HALOCARBON	8-23-88	2:30 p.m.	601

LABORATORY ANALYSIS REPORT AND RECORD

DATE 4 OCT 86

USAFCERL/SA
BROOKS AFB TX 78235-5501

SAMPLE IDENTITY: WATER

DATE RECEIVED: 3 OCT 86

SAMPLE FROM:

LAB CONTROL NR:

TEST FOR: VOLATILE AROMATICS

METHODOLOGY: EPA 602

				DETECTION LIMIT	
QEHL No.		68603			
BASE No.		GN860004		ND	TR
Benzene	34030	ND		1.0	2.0
Chlorobenzene	34301			1.0	2.0
1,2-Dichlorobenzene	34536			2.0	3.0
1,3-Dichlorobenzene	34566			2.0	3.0
1,4-Dichlorobenzene	34571			2.0	3.0
Ethylbenzene	34371			1.0	2.0
Toluene	34010	3.4		1.0	2.0

Results in micrograms per liter.

ND = None Detected. Less than the detection Limit
TRACE = Present, but quantity less than quantitative limit.

DATE ANALYZED: 8 OCT 1986

REQUESTING AGENCY (Mailing Address)

137 TAC HOSP
Will Rogers ANGB, OIC
73169-5300

BCA

LABORATORY ANALYSIS REPORT AND RECORD (General)

DATE: 10Oct86

TO: Will Rogers ANGB

FROM: USAFOEHL/SA
BROOKS AFB TX 78235-5501

SAMPLE IDENTITY: Water

DATE RECEIVED: 30Oct86

SAMPLE FROM: Sewage Sample Effluent

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA 601

OEHL No.		68602				DET LIMIT
BASE No.		GN860008				
Bromodichloromethane	32101	ND				0.1
Bromoform	32104					0.2
Bromomethane	34413					1.0
Carbon Tetrachloride	32102					0.1
Chlorobenzene	34301					0.2
Chloroethane	34311					0.5
2-Chloroethylvinyl ether	34576	↓				0.1
Chloroform	32106	1.9				0.1
Chloromethane	34418	ND				0.1
Dibromochloromethane	32105					0.1
1,2-Dichlorobenzene	34536					0.2
1,3-Dichlorobenzene	34566					0.2
1,4-Dichlorobenzene	34571					0.2
Dichlorofluoromethane	34668					0.1
1,1-Dichloroethane	34496					0.2
1,2-Dichloroethane	34531					0.2
1,1-Dichloroethene	34501					0.1
trans1,2-Dichloroethene	34546					0.1
1,2-Dichloropropane	34541					0.1
cis1,3-Dichloropropene	34704					0.2
trans1,3-Dichloropropene	34699					0.2
Methylene Chloride	34423					0.2
1,1,2,2-Tetrachloroethane	34516					0.1
Tetrachloroethylene	34475	↓				0.1
1,1,1-Trichloroethane	34506	0.5				0.1
1,1,2-Trichloroethane	34511	ND				0.1
Trichloroethylene	39180					0.1
Trichlorofluoromethane	34488					0.1
Vinyl Chloride	39175	↓				0.2

Results in micrograms per liter.

ND = None Detected. Less than the detection Limit.
TRACE = Present, but quantity less than quantitative limit.

REQUESTING AGENCY (Mailing Address)

137 TAC Hosp
Will Rogers ANGB, OK
73169-5000

DATE ANALYZED: 9Oct86

BCN

SMS

Appendix F

PCB Testing

PCB TESTING

The Oklahoma Air National Guard at Will Rogers World Airport has investigated the presence of polychlorinated biphenyls (PCBs).

All on-Base air compressors are PCB-free. Three compressors located in Buildings 1002, 1012, and 1020 are oil-less and are used for breathable air. All others utilize SAE 30 Engine Oil for a lubricant. (See page F-2.)

The transformers on the Base are owned and operated by Oklahoma Gas and Electric (OG&E). These transformers were tested by OG&E in 1986 and were found to be non-PCB, according to current Federal Regulations (40 CFR, Part 761, May 31, 1979). [See pages F-3 - F-4.] Also, any transformer leaks or spills are handled by OG&E.

OKLAHOMA AIR NATIONAL GUARD
HEADQUARTERS 137TH TACTICAL AIRLIFT WING (ANG) (MAC)
P.O. STA. 18, WILL ROGERS WORLD AIRPORT
OKLAHOMA CITY, OKLAHOMA 73169-5000

REPLY TO ATTN OF: 137CES/DE (Michael L. Randall, X-313) 3 Jun 86

SUBJECT: PCB Content of Air Compressor Systems

TO: 137CES/DE

1. Reference letter dated 6 May 86 from ANGSC/DEV pertaining to the use of lubricants in air compressors, the following is a list of compressors and lubricant used:

BLDG. NO.	QTY.	LUBRICANT	
1002	1	SAE 30 Engine Oil	NO PCB'S PRESENT IN AIR COMPRESSORS.
1007	2	"	
1008	1	"	
1011	2	"	
1013	1	"	
1020	2	"	
1027	1	"	
1033	2	"	
1035	1	"	

2. This is a complete list of all compressors to date with the exception of the three oil-less compressors used for breathable air. These are located in Bldgs. 1002, 1013 and 1020.

Michael L. Randall
MICHAEL L RANDALL
Maint. Supt.

OKLAHOMA ELECTRIC COMPANY 321 North Harvey Post Office Box 321 Oklahoma City, Oklahoma 73101 Telephone 405 272 3000

OG&E
ELECTRIC SERVICE

April 21, 1986

Captain Peter M. Shanahan
Oklahoma Air National Guard (ANG)
Box 18, Will Rogers World Airport
Oklahoma City, OK 73169-5000

Re: OG&E owned transformers at Will Rogers ANG Base
(listing attached)

OG&E is pleased to inform you that the present transformers at the referenced location has a fluid which has been tested for polychlorinated biphenyls (PCB) and is non-PCB according to current Federal regulations 40CFR, Part 761 May 31, 1979.

If we can be of further assistance, please do not hesitate to call.

Sincerely,

Charles L. Tyree

Charles L. Tyree
Manager Environmental Affairs

CLT:LAB:drb
cc: Leon Grover/Don Roe

OKLAHOMA AIR NATIONAL GUARD
TRANSFORMER REPORT

STA#	LOCATION
06242	SW 58 & STANFRD
06242	SW 58 & STANFRD
20738	BLDG #1008
20738	BLDG #1008
20738	BLDG #1008
22888	BLDG #1015
22888	BLDG #1015
22888	BLDG #1015
42288	BLDG #1020
58232	BLDG #1015
58232	BLDG #1015
58232	BLDG #1015
73905	AERIAL PORT #3
15578	BLD #1014
58881	BLDG #1033
06308	BLDG #1013
06308	BLD #1013
06308	BLDG #1013
41103	BLDG 1007
50300	BLDG #1016
50300	BLDG #1016
50300	BLDG #1016
17206	BLDG #1022
17206	BLDG #1022
17205	BLDG #1009
20733	BLDG #1009
65279	BLDG #1035
17205	BLDG #1009
17205	BLDG #1009
17205	BLDG #1009
06237	BLDG # 1030
06238	BLDG # 1005
17204	BLDG # 1012
17207	BLDG # 1001
53774	BLDG # 1001
73064	BLDG # 1026

Appendix G

Pest Management Program

PEST MANAGEMENT PROGRAM

Programs involving pesticides must comply with state and federal Environmental Protection Agency (EPA) Regulations. The Base has a Pest Management Plan in which a contractor provides necessary pest control services. The contractor has been certified by the state to apply pesticides, and their work is done under the supervision of Base personnel who have been certified by the Department of Defense (DoD) to select, handle, and apply pesticides.

The pesticides used at the Base are Pyrid and Contrax. Pyrid is used to control ants, spiders, silverfish, beetles, fleas, roaches, moths, and ticks. (See pages G-2 thru G-6.) Contrax is the specified pesticide for the control of rats and mice. (See pages G-7 thru G-8.)

Pest control for most facilities is provided on a quarterly basis. However, dining areas and food storage areas are treated on a monthly basis. The contract also provides as-needed services in cases of occasional, invading, or nuisance pests.

Any wastes resulting from pest control are disposed of by the contractor. Also, the contractor is responsible for the disposal of dead pests in accordance with local ordinances.

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW

INSTALLATION OR CITY OR	COMMAND	DATE
WILL ROGERS ANG BASE	AIR NATIONAL GUARD	17 NOV 87

PERSON TO CONTACT/AUTOVON NO.

MAJOR ALAN J. GAGNON/956-8121 or 8111

REFER TO AFR 91-11 BEFORE COMPLETION

OBJECTIVE	1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 35044 b) Rats c) Control of rats
PESTICIDE	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) 3-[3-(4 Bromo-(1-biphenyl)-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one b) Contrac (c) Bell Labs (d) EPA Reg. No. 12455-36
APPLICATION	3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Solid b) Solid
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
SENSITIVE AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
REMARKS	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building Custodians and DE e) Preventative in conformance to EPA and state regulations. f) Solid pellets g) $3,744.00 per year

AF FORM 648

Atch 2

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY, OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-11 BEFORE COMPLETION

OBJECTIVE	1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 85044 b) Silverfish c) Control of silverfish
PESTICIDE	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) Cyano (3-phenoxyphenyl)methyl, 4-chloro-alpha-(1-methylethyl)benzeneacetate b) Pyrid (c) Terminix (d) EPA Reg. No. 1021-1523-1927 e) 7.12% Active Ingredients, 92.88% Inactive 1/3 fl oz sol/3 gal. Water
APPLICATION	3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Water emulsion b) Water
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
SENSITIVE AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
REMARKS	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building custodians and DE e) Preventative in conformance to EPA and state regulations. f) Pyrid-2 oz. per gal./water for re-curring treatment, 4 oz. per gal./water for initial or clean out treatment. g) $3,744.00 per year

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY, OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-31 BEFORE COMPLETION

OBJECTIVE	1. a. Project No. b. Target Pest c. Purpose (Specify)	a) 85044 b) Beetles c) Control of beetles
PESTICIDE	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) Cyano (3-phenoxyphenyl)methyl, 4-chloro-alpha-(1-methylethyl)benzeneacetate b) Pyrid (c) Terminix (d) EPA Reg. No. 1021-1523-1977 e) 7.12% Active Ingredients, 92.88% Inactive 1/3 fl oz sol/3 gal. Water
APPLICATION	3. a. Form Applied (dust, emulsion, gas, etc.) b. Diluent	a) Water emulsion b) Water
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method (aerial, ground, manual, etc.)	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
SENSITIVE AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution (croplands, lakes, streams, food, human exposure, endangered species, etc.)	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
REMARKS	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building custodians and DE e) Preventative in conformance to EPA and state regulations. f) Pyrid-2 oz. per gal./water for re-curring treatment, 4 oz. per gal./water for initial or clean out treatment. g) $3,744.00 per year

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY, OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-21 BEFORE COMPLETION

OBJECTIVE	1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 85044 b) Roaches c) Control of roaches
PESTICIDE	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) Cyano (3-phenoxyphenyl)methyl, 4-chloro-alpha-(1-methylethyl)benzeneacetate b) Pyrid (c) Terminix (d) EPA Reg. No. 1021-1523-1927 e) 7.12% Active Ingredients, 92.88% Inactive 1/3 fl oz sol/3 gal. Water
APPLICATION	3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Water emulsion b) Water
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
SENSITIVE AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
REMARKS	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building custodians and DE e) Preventative in conformance to EPA and state regulations. f) Pyrid-2 oz. per gal./water for re-curring treatment, 4 oz. per gal./water for initial or clean out treatment. g) $3,744.00 per year

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-11 BEFORE COMPLETION

1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 85044 b) Mice c) Control of mice
2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) 3-[3-(4 Bromo-(1-biphenyl)-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one b) Contrac (c) Bell Labs (d) EPA Reg. No. 12455-36
3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Solid b) Solid
4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building Custodians and DE e) Preventative in conformance to EPA and state regulations. f) Solid pellets g) $3,744.00 per year

DD Form 646

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY, OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-11 BEFORE COMPLETION

TIVE	1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 85044 b) Ants c) Control of ants
	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) Cyano (3-phenoxyphenyl)methyl, 4-chloro-alpha-(1-methylethyl)benzeneacetate b) Pyrid (c) Terminix (d) EPA Reg. No. 1021-1523-1927 e) 7.12% Active Ingredients, 92.88% Inactive 1/3 fl oz sol/3 gal. Water
	3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Water emulsion b) Water
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building custodians and DE e) Preventative in conformance to EPA and state regulations. f) Pyrid-2 oz. per gal./water for re-curring treatment, 4 oz. per gal./water for initial or clean out treatment. g) $3,744.00 per year

US AIR FORCE PEST MANAGEMENT PROGRAM REVIEW	INSTALLATION: WILL ROGERS ANG BASE OK CITY, OK	COMMAND: AIR NATIONAL GUARD	DATE: 17 NOV 87
	PERSON TO CONTACT/AUTOVON NO.: MAJOR ALAN J. GAGNON/956-8121 or 8111		

REFER TO AFR 91-11 BEFORE COMPLETION

OBJECTIVE	1. a. Project No. b. Target Pest c. Purpose *(Specify)*	a) 85044 b) Spiders c) Control of spiders
PESTICIDE	2. a. Active Ingredient(s) b. Trade Name c. Manufacturer d. EPA Registration No. e. Concentration	a) Cyano (3-phenoxyphenyl)methyl, 4-chloro-alpha-(1-methylethyl)benzeneacetate b) Pyrid (c) Terminix (d) EPA Reg. No. 1021-1523-1927 e) 7.12% Active Ingredients, 92.88% Inactive 1/3 fl oz sol/3 gal. Water
APPLICATION	3. a. Form Applied *(dust, emulsion, gas, etc.)* b. Diluent	a) Water emulsion b) Water
	4. a. Contract or In-house Application b. Supply Source & NSN	a) Contract b) Contractor supplied
	5. a. Method *(aerial, ground, manual, etc.)*	a) Manual
	6. a. Acres or Other Units to be Treated b. Number of Applications c. Number of Sites d. Specific Identity of Sites	a) All base facilities b) Quarterly for all facilities - Monthly for Dining Halls c) 35 d) Offices, Hangars, Warehouses, Mechanical Rooms, Medical, Dining, Fire Protection, Maint Areas.
	7. a. Month(s) of Year b. State	a) Quarterly based on award date of contract b) Oklahoma
SENSITIVE AREAS	8. a. Areas to be Avoided b. Areas to be Treated with Caution *(croplands, lakes, streams, food, human exposure, endangered species, etc.)*	a) Motor housings, junction and switch boxes, other electrical equipment b) Dining Areas, Food Storage, Medical Facility
REMARKS	9. a. Precautions to be Taken b. State and Local Coordination c. Other d. Organization Responsible for Surveillance (DE or SG) e. IPM Controls, Type and Location, Preventative or Corrective f. Finished Spray Concentration g. Cost	a) Safety and Contamination Precautions exercised throughout all facilities at all times. d) Building custodians and DE e) Preventative in conformance to EPA and state regulations. f) Pyrid-2 oz. per gal./water for re-curring treatment, 4 oz. per gal./water for initial or clean out treatment. g) $3,744.00 per year

Appendix H

Storage Tanks

STORAGE TANKS

TABLE H.1: Fuel Storage Tanks*

Location	Capacity	Contents	Date Installed	Tank Construction	Status
Bldg 1002	6000 gal	Unleaded MOGAS	1987	Fiberglass	Active
Bldg 1002	6000 gal	Diesel	1987	Fiberglass	Active

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* Piping is fiberglass reinforced plastic.

* Inspected annually: above ground visual inspection.

TABLE H.2: Oil/Water Separators* and Miscellaneous Tanks

Location	Tank Type	Contents	Status
Bldg 1002	O/W Separator	Waste Oil	Active
Bldg 1002	Sewage Lift Station	Waste Water	Active
Bldg 1002	Acid Neut. Tank	---------	Active
Bldg 1007	O/W Separator	Waste Oil	Active
Bldg 1011	O/W Separator	Waste Oil	Active
Bldg 1013	O/W Separator	Waste Oil	Active
Bldg 1020	O/W Separator	Waste Oil	Active
Bldg 1021	O/W Separator	Waste Oil	Active
Bldg 1033	O/W Separator	Waste Oil	Active

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* All O/W separators are on the recurring maintenance program and are inspected and cleaned quarterly.

* All O/W separators overflow into the sanitary sewer as of 1982. Initially, overflow went to storm sewer system.